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FAIR VALUATION OF LIABILITIES

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ABSTRACT

A project to develop an Accounting Standard for Insurance, with the aim of enhancing understandability, relevance, reliability and comparability of general purpose financial reporting for insurance worldwide, is being progressed by the International Accounting Standards Board. The basis of the proposals is that assets and liabilities be shown at fair values (market values for quoted instruments). This paper, prepared by a Working Party established by the Life Board of the United Kingdom actuarial profession, summarises and comments upon a number of the principal features of the proposals, as they have emerged up to September 2001. The paper goes on to consider how a system of reporting for prudential regulatory purposes might be built upon a fair value general reporting base, summarising the thinking of a number of other bodies, proposing certain principles and suggesting lines of development. The appendices to the paper discuss a number of issues in further depth and present some illustrative results of some investigations into applying fair value methods in practice. The emphasis of the paper is on reporting for life assurance business, although many of the principles apply equally to general insurance.

KEYWORDS

Fair Value; Entity Specific; Financial Reporting; Market Value Margin; Replicating Portfolio; Risk-Based Capital; Statutory Solvency Reporting; Stochastic Methods; Deflators; With-Profits

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1. Overview and Introduction

1.1 *Introduction*

1.1.1 At the same time as this paper was being finalised for publication, a Steering Committee, established by the International Accounting Standards Committee, now succeeded by the International Accounting Standards

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Board (IASB), was finalising, as a report to the new IASB, a Draft Statement of Principles for an International Accounting Standard for Insurance. This initiative, which relates to the general purpose reporting of both life and general insurers, has reached the present stage in parallel with, and slightly behind, a similar initiative on an International Accounting Standard for Financial Instruments, the key feature of which is that such accounting be a balance sheet-based system with instruments being reported at 'fair value'. Assuming that the financial instruments initiative continues to proceed, it is expected that the insurance initiative will also do so on a fair value basis, with publication of a draft standard around end-2002, a final standard in 2004, and implementation in 2005. If the financial instruments initiative does not proceed, or is delayed, it is proposed that the insurance initiative should proceed anyway, on a closely similar (but technically non-fair value) basis — see ¶1.3.2 *et seq*.

1.1.2 Fair value is defined 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 the case of assets or liabilities traded in a deep liquid market, fair value is generally taken as equal to market value.

1.1.3 At the end of 1999, the Life Board of the Faculty of Actuaries and the Institute of Actuaries established a working party, the Fair Valuation Working Party, to consider a number of issues arising from this initiative, and, in particular, the opportunity that the initiative might offer for the development of an improved approach to reporting for prudential supervisory purposes, unconstrained by current regulatory requirements. The membership of the Working Party and its Terms of Reference are attached as Appendix A. This paper sets out the Working Party's emerging conclusions. While many of the principles discussed apply equally to general insurance, the emphasis of the paper is on reporting for life assurance business. Equally, the focus on practical issues relates primarily to the United Kingdom market, even though the principles we propose would apply worldwide.

1.1.4 Whilst several issues of some significance remain unresolved, the thrust of the Steering Committee's thinking seems clear (at the level of broad principles — the manner of implementation has yet to be determined). Given the significance of the proposed changes for insurance business, the Working Party has been encouraged to publish its findings and thinking to date, in order to assist and broaden awareness and debate on this important subject.

1.1.5 The structure of the paper is as follows. After a brief discussion (in Section 2) of the different purposes for which a valuation might be done, Section 3 provides an overview of the Steering Committee's proposals. In Section 4 the Working Party notes certain issues on which the Steering Committee has not taken a position, and has set out its own views on how these issues might best be resolved. In Sections 5 to 8 the Working Party

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develops and suggests principles and approaches for the prudential supervisory reporting requirements that might be built upon a fair value general reporting base. For with-profits business, a separate Section 9 has been prepared, which brings general purpose and prudential reporting considerations together. Section 10 comments on the role of the actuary and the actuarial profession. The paper closes with Section 11, on summary remarks and further work, after which there is a series of appendices, including notes on a number of issues. The final appendix sets out some illustrative numerical examples produced by a Fair Values Calculation Group. The group was set up jointly by the Working Party and the Life Assurance Issues Committee of the Life Board, and consisted of members of the Faculty's Bonus and Valuation Research Group, along with individual volunteers from the Institute of Actuaries. The remainder of Section 1 comprises an overview of the paper.

1.2 *Valuation Purposes*

Actuaries have long recognised that no single valuation of the liabilities of an insurance (or, indeed, of many other types of) company can serve all purposes. Different assumptions and approaches to valuation are appropriate, depending on such considerations as: whether the company is being viewed as a going concern or as a closed operation; whether the investigation is part of a general purpose assessment of a company's financial progress or to assess its ability to meet claims and other obligations in all but the most extreme of circumstances; or whether or not it is appropriate to bring in to the valuation the effect of potential future new business (whether in the company's present form or after some corporate rearrangement). Frequently in the past, and indeed currently, a valuation for one purpose has been prepared with little or no attempt to relate it to other valuations. The present development offers the opportunity to build (at least) most valuations on a core general purpose valuation base. For the purpose of this paper, the core valuation base is taken to be the fair value-based valuation (or an alternative non-fair entity-specific valuation — see ¶1.3.2) being developed by the Steering Committee.

1.3 *The Proposals — General Purpose Reporting*

1.3.1 Under the Steering Committee's proposals, the Accounting Standard would apply to insurance contracts (i.e. to insurance business, not companies), with the unit of account being groups of similar contracts. The same Standards would apply to both long-term and short-term insurance business. The accounting approach would be an 'asset and liability' approach, where the driver is the balance sheet (the alternative being a 'deferral and matching' approach, where the driver is the desire to match income and outgo in the revenue account), with both assets and liabilities being reported at fair values (assuming that asset reporting, being governed,

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in the main, by the Financial Instruments Accounting Standard, moves to a fair value basis). No present accounting approach satisfies fully the fair value criterion, though there are examples of non-fair value asset and liability approaches which would share many features with the proposals.

1.3.2 Where an asset or a liability is traded on a deep and liquid market, fair value would generally be taken as market value. The primary challenge in fair value accounting is the assessment of fair value, where the instrument (asset or liability) is not so traded, which applies to the vast majority of insurance liabilities. The value of an insurance liability in such a case would be a calculated value, using assumptions concerning future events, risk provisions and discount rates that an independent marketplace participant would make in determining the amount that it would charge to assume such a liability. The Steering Committee's proposal of an alternative (non-fair value) approach, using a company's own expectations/assumptions, is referred to as an entity-specific approach. The two approaches will be discussed in the Draft Statement of Principles. In practice, the difference between the two approaches is likely to be small, given that the fair value approach will, in any event, take account of the actual characteristics of the business, and generally involve using the insurer's own assumptions, except where there is evidence that the market's assumptions would be different.

1.3.3 Where possible, the assumptions, risk provisions and discount rates would be calibrated to those exhibited by similar quoted instruments. It is expected that the assumed liability cash flows would include the margin over best estimate assumptions that the market would charge, a market value margin (MVM), for non-diversifiable risks. It is acknowledged that, insofar as a policy is expected to generate margins in excess of MVMs, the policy would generate a profit at point of sale. Liability valuations would not, in general, depend on how the corresponding assets were invested, except in the case of those business types (unit-linked and most forms of with-profits) where the policy benefits depend on the choice of backing investments.

1.3.4 The Steering Committee did not reach a final view on one of the more contentious issues surrounding fair value accounting, namely whether a company's credit standing should be allowed for in determining the fair value of liabilities. It believes that own credit standing is technically part of fair value, but is concerned about the implications. It has proposed, though, that own credit standing should not be included in the entity-specific value.

1.3.5 Taken as a whole, the Working Party is supportive, in principle, of the proposals to move to fair value-based accounting (or to the entity-specific alternative). The proposals represent a valuable opportunity towards achieving the target characteristics (understandable, relevant, reliable and comparable — see ¶3.1.3) of the IASB Framework. There will, however, be major practical challenges, and one of the difficulties with the proposal is that a substantial degree of professional judgement will be required in arriving at fair values for unquoted instruments (including insurance liabilities), so

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reducing comparability between different companies' accounts. In order to address this point, the Working Party has proposed for discussion the possibility of establishing a permanent Actuarial Standards Board to provide ongoing guidance on interpreting fair value.

1.3.6 A further practical challenge will be that of finding a reporting framework within which the underlying realities are not obscured by overall earnings volatility.

1.4 *Prudential Reporting*

1.4.1 The Working Party proposes six principles that should apply to prudential reporting:

(1) Although fair value liabilities incorporate (market value) margins, these cannot, as a general rule, be deemed adequate for prudential supervision. Further margins should be held.
(2) However expressed, it is important that these additional requirements be transparent to customers, regulators, investors, rating agencies and other industry commentators, so that informed judgement can easily be made as to the relative solvency positions of different companies.
(3) As far as possible, a prudential supervision system should ensure a level playing field, so that the same risk should lead to the same capital requirement, regardless of the legal form of the institution assuming the risk.
(4) A prudential supervision system should reinforce good risk management practice, with suitable reductions/increases in capital requirements, according to whether or not such good practices were being followed.
(5) The determination of capital requirements should have appropriate regard, *inter alia*, to actual backing assets (and how well they match the associated liabilities), and to options available to policyholders.
(6) A set of trigger points should be set above the point of 'genuine' economic insolvency, to act as warning signs of capital tending to become insufficient, so that orderly action can be put into place.

1.4.2 The Working Party believes that prudential reporting should be carried out within a fair value reporting framework, so that the general purpose accounts define the amount of capital available, and the prudential reporting standards determine the minimum amount of capital required. We favour a risk-based capital approach, by which we mean an approach under which the capital requirement is related to risk of default or ruin, and is determined in a (more or less) scientific way, having regard to the risks to which the business is exposed.

1.4.3 The Working Party has reviewed current trends in prudential reporting. In particular, it has considered the emerging views of the Financial Services Authority in the U.K. and of the International Association of Insurance Supervisors, and has reviewed the recently published New Basel

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Capital Accord and the proposals made by the International Actuarial Association in its response to the first set of proposals from the Steering Committee. There are common threads in all of these supervisory developments, which, in the view of the Working Party, would be consistent with a move to a risk-based capital requirement for the purposes of prudential reporting built on a fair value base.

1.4.4 There are two broad approaches to calculating risk-based capital. The 'building blocks' approach involves applying defined factors to individual measures of risk (e.g. sums assured), and this is the approach that is currently taken by regulators. It has the benefit of simplicity, but often allows only crudely for the true risk situation of a company. More sophisticated probabilistic approaches, such as stochastic modelling, seek to model the risk factors statistically, and the required level of capital corresponds to an explicit ruin probability. Development of the latter approach is being encouraged for banks, via the Basel Committee proposal to allow banks to use internal models to set capital requirements.

1.4.4.1 The Working Party recognises the practicality of the building blocks approach, but would encourage the development of more sophisticated approaches, by allowing companies which can satisfy the regulators that their internal models are sufficiently robust to use them for determining required capital.

1.4.4.2 It is suggested that a degree of extra conservatism be built into any building blocks approach, by way, both of encouragement to companies to develop internal modelling capability, and to recognise that companies that do not take the internal route may have chosen not to do so due to a belief that an internal model would result in increased capital requirements.

1.4.4.3 The Working Party considers that the use of internal models, coupled with ongoing dialogue with regulators, will allow emerging best practice to be fed back into general use. Further development and refinement of methods will be necessary for some years (at least) before a final robust set of standards can be said to have been achieved.

1.4.5 The sources of risk can be categorised as: (i) uncertainty (in best estimate assumptions); and (ii) volatility of experience around true best estimate assumptions. Insofar as a reliable statistical model can be established, best estimate liabilities would correspond to a probability of meeting liabilities in about 50% of cases; fair value (i.e. best estimate plus market value margin) would correspond to a rather higher probability, perhaps somewhere in the range of 55% - 80%. The probability for best estimate plus required risk-based capital might be 95% plus across the lifetime of a portfolio.

1.4.6 The Working Party considers that the task of setting ruin probabilities for the risk-based capital requirements would properly fall to the regulators. Considerations to be borne in mind in setting a suitable figure would include striking a balance between the natural desire to protect the

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insurance-buying public against the consequences of default and the need to ensure that companies are not deterred from providing desirable insurance services by too extreme a capital requirement. Of course, some risks may require high levels of capital, and the Working Party recognises that this may have implications for the products which are offered to customers in the future. As regards transition arrangements, we believe that, in the early years of such a new risk-based capital system, it would be reasonable to avoid too abrupt a change between the capital requirements implicit in the current regime and that in the replacement regime.

1.4.7 Investment-related risks, including those relating to financial guarantees, comprise a particularly important risk category for many forms of insurance. There is significant scope to control such risks through the use of asset matching and other forms of hedging, and the Working Party considers that required capital should pay close regard to the company's matched/hedged situation. Methods of determining risk-based capital which pay such regard include stress testing and stochastic simulations. The former identifies the capital required to allow the company to withstand all of a set of predetermined scenarios. The latter relates to the use of probabilistic models, under which a large number of future scenarios are generated and the outcome for the company's business under each is investigated. The latter approach allows directly for specified ruin probabilities, albeit the absolute significance of the results is only as good as the underlying stochastic model. The Working Party, in principle, would encourage the use of stochastic methods. However, notwithstanding the existence of certain stochastic engines for a number of years, notably the Wilkie model, further investigation and development is needed into the ability of models to replicate what happens at the 'tail' of the distribution, which is the area of greatest interest for the purpose of establishing solvency criteria, before the probabilities associated with extreme scenarios can be given practical credibility. Nonetheless, we consider that use of such models is capable of resulting in prudential capital requirements, which are superior to those derived from present methods, in meeting level playing field requirements and appropriately rewarding (with reduced capital requirements) good risk management practices.

1.4.8 With regard to non-financial risks, the Working Party considers that, at the present time, the application of stochastic techniques would, in most cases, be very difficult, due to the paucity of tried and tested stochastic models for such risks as mortality (and other technical insurance risks), withdrawals and expenses. However, the classic techniques of incorporating margins for adverse deviations are applicable — the challenge will be to provide standards that are reasonably consistent between companies and over time; hence, our suggestion of an Actuarial Standards Board. As regards withdrawals, consideration has been given as to whether the reserve plus required margin should, at a minimum, at least match any

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discontinuance value available; our view is that there is a good case for such a minimum, applied on a policy-by-policy basis, when considering prudential solvency.

1.5 *With-Profits Business*

1.5.1 With-profits business, at least as it is transacted in the U.K., has several special features, and the Working Party has felt that it deserves its own section (Section 9).

1.5.2 All forms of the business share the feature that benefits depend on the actual backing assets, with the overlays of smoothing, minimum benefit guarantees and sometimes other financial options. However, in terms of the matter of participation (do policies share in all profits of the business or just in some?) and discretion (to what extent are directors constrained in the manner in which profits are distributed?), there is a two-dimensional range of types of with-profits business. Also, some with-profits businesses include undistributed accumulated surpluses that are not attributable to current policyholders.

1.5.3 The Steering Committee has proposed that, where a company has a legal or constructive obligation to allocate surplus to policyholders, whether accrued terminal bonus or some element of estate distribution, then that obligation should be treated as a liability. The Working Party agrees with this for general purpose reporting. Possible methods of calculation are the use of values derived from stochastic modelling and the use of what is termed a PRE (policyholder reasonable expectation) surrender value, with adjustments as appropriate for future profits or losses due to smoothing, costs of guarantees and expenses (vs charges). In respect of all other surplus, i.e. where the insurer has no legal or constructive obligation at the balance sheet date to allocate part of the surplus to current or future policyholders, or, having such a legal or constructive obligation, cannot measure that obligation reliably, the Steering Committee proposed that it should be classified as equity. Thus, under a fair value approach, the liability for with-profits business would be based on (smoothed) aggregate asset shares, increased, as appropriate, to allow for the cost of future smoothing or guarantees.

1.5.4 The Working Party believes that, where policyholders and shareholders both have an interest in the resulting equity (as would be the case for a 90:10 fund), the respective interests should be shown.

1.5.5 For prudential reporting purposes, and for certain 'classic' (maximum discretion and participation) forms of with-profits, the process of risk sharing could result, at least in theory, in some policies being net contributors to coverage of the company's risk-based capital requirement, i.e. effectively generating a negative risk-based capital requirement. Historically, this was an important feature of how with-profits business worked, albeit it was not described in those terms. Looking forward, companies seeking to

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apply this rationale would need to satisfy themselves that such risk-sharing would be available to the company in law, having regard to the reasonable expectations of policyholders.

1.5.6 In determining any (net) risk-based capital requirement for a portfolio of with-profits policies, appropriate allowance for PRE must be made. This will involve assumptions regarding future bonus and smoothing policy and asset mix, and how they might be affected by changes in investment conditions. The Working Party is of the view that stochastic modelling is the most appropriate technique for this purpose. It is important that such modelling takes into account all relevant factors, including, in particular, whatever discretion is open to the office and the extent to which the current asset mix of the backing assets is affected by short-term investment considerations.

1.6 *Numerical Investigations*

1.6.1 The Fair Values Calculation Group has carried out some investigations into applying fair value principles in practice, described in Appendix C. It has investigated the application of the principles to a with-profits bond, a unit-linked regular premium policy, an annuity and a term assurance. Its work gives valuable early insight into a number of the practical issues involved when seeking to convert theory into practice, including selecting and calibrating models, developing bonus assumptions for use in stochastic processes, and developing a replicating portfolio. The Working Party is happy to include its report, for which the Fair Values Calculation Group takes responsibility, in this paper.

2. Purposes of Actuarial Valuation

2.1 Actuarial valuations of insurance liabilities are required for a number of different purposes, including:

(1) determining reported accounting profits and associated tax;
(2) statutory solvency assessment, and distribution of surplus;
(3) assessing a company's ability to meet policyholders' reasonable expectations (PRE); and
(4) company valuation for investment appraisal.

2.2 A single valuation of the business will not, as a rule, be suitable for all of these purposes, and quite separate valuations are generally carried out for the different purposes.

2.3 The features of the different types of valuation are as follows.

2.3.1 *General purpose profit reporting*

The intended audiences for such reporting will generally be shareholders

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and others interested in the overall financial progress of the business, and a going concern approach to the business is appropriate, with a realistic assessment of liabilities consistent with the valuation of assets. The valuation should be on a 'true and fair' basis, embodying only the degree of prudence required in accounting terms.

2.3.2 *Solvency*

2.3.2.1 The intended audiences for such reporting will be prudential regulators and other 'special publics' considering the company's situation on behalf of customers, plus anyone else interested in the company's financial strength generally, and in its capital position. Both going concern and 'closed to new business' situations need to be considered. Prudential margins (which may be explicit or implicit) are needed, in accordance with requirements of regulators, which should, in turn, reflect the public view of acceptable standards of solvency. There may be more than one set of margins, representing a spectrum in terms of stringency, each level of stringency being the trigger for proportionate action by the company and/or regulators when a company 'crosses the line'.

2.3.2.2 Margins should be spread suitably across all business types, to ensure that regulatory requirements do not, in themselves, favour particular classes of business relative to others. Opportunities for regulatory arbitrage by writing classes of business under different regulatory regimes should be limited.

2.3.2.3 The margins required should be such as to encourage good prudential behaviour.

2.3.3 *Assessing capability of meeting PRE*

The likely audience for these valuations and investigations is, in the first instance, likely to be the company's own board or senior management, though the outcome of the work may well feed into the methods, assumptions and disclosure associated with general purpose or solvency reporting. A going concern approach is appropriate, with a realistic assessment of both assets and liabilities. This should include due allowance for distribution of future profits in accordance with PRE.

2.3.4 *Company valuation for investment appraisal*

The emphasis here is wholly on the shareholders' interest in the company. Interested parties would be present and prospective proprietors, plus, possibly, the courts, regulators and 'special publics'. A realistic valuation on a going concern basis is likely to be appropriate. In addition, a view would be needed on the value of future new business or goodwill. Bonus philosophy for with-profits business will be relevant, as this will affect the incidence of profits emerging. A view would be needed on ownership of any orphan surplus.

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2.4 As discussed later in the paper, the Working Party's view is that it would be preferable, as far as possible, to use a single consistent method or family of valuations for all purposes, with stated, quantified adjustments, showing the relationships between the valuations.

3. Fair Value in General Purpose Reporting — the Proposals

3.1 *Background*

3.1.1 The IASB's project on insurance accounting started in 1997, with the objective of developing an International Accounting Standard for insurance business. It was felt that such a Standard was needed, due to the wide range of accounting practices being used by insurers, and the fact that such practices often differ significantly from the corresponding practices being used by other enterprises in the same country. These factors made comparison of financial statements difficult.

3.1.2 The first stage of the project was the production, by the Steering Committee, of a two-volume Issues Paper, published in November 1999. The paper attracted 138 responses from interested parties, with general support from the actuarial profession, the U.K., Canada, Australia and some parts of Scandinavia, and general opposition from industry and regulators in the rest of continental Europe, Japan and the United States of America to the overall thrust of the proposals, with much debate on various sub-issues. The actuarial profession has been closely involved in providing comment on the proposals, both through national actuarial bodies and (particularly) through the International Actuarial Association (IAA), which provided one of the most substantial of all responses to the paper, including suggestions as to how some of the difficult knock-on issues might be addressed.

3.1.3. The Steering Committee based its proposals on the IASB's Framework for the Preparation and Presentation of Financial Statements, and, in particular, on the four basic target characteristics, *viz.* that they be readily understandable by users, relevant to their decision-making needs, reliable (representing transactions and other events in accordance with their substance and economic reality), and comparable over time and between different enterprises. The proposals were influenced by another IASB project, developing a new standard for financial instruments, which was at a more advanced stage and advocated fair value-based reporting. On the assumption that a fair value basis would be adopted for financial instruments, although there was, and remains, strong opposition to this, the Steering Committee proposed that the new insurance standard should also be based on fair values.

3.1.4 Subsequent to the above, the Steering Committee has been firming up its reaction to the responses, and had its last formal meeting in June 2001. As its last act, the Steering Committee is finalising a Draft Statement of

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Principles (DSOP) for an International Accounting Standard for Insurance, for discussion by the IASB itself in October 2001. The Steering Committee will then dissolve itself, albeit its members will form the nucleus of an advisory committee to IASB staff, who will be taking the project forwards. It is, we understand, unlikely that the DSOP will be formally published, but we might expect to learn its principal features. When our paper is discussed, we intend to make reference to any significant information that has emerged by then. Under the current timetable, an Exposure Draft will follow in 2002, which will form a basis for production of the finalised standard. Implementation, i.e. production of accounts on the new standard, is planned for 2005. Given the complexity of the subject matter, the need for consultation with interested parties throughout the process, and the diverse characteristics and interests of entities offering insurance around the world, there is likely to be some pressure on this timetable.

3.1.4.1 It is expected that quoted companies in the European Community will be required, from 2005, to report in accordance with International Accounting Standards. Thus, if full fair value-based accounting for insurance has reached this stage by 2005, it should be expected that implementation for such companies is only a little over four years off.

3.1.5 The Steering Committee's proposals fall, in the main, into what, in ¶2.3.1, we have referred to as general purpose reporting. As such, it is not intended that the new IASB standard will encompass issues of reporting for solvency, although the Steering Committee hopes that the accounting standard developed will provide the base data upon which further regulatory requirements could be built.

3.2 *The Proposals*

3.2.1 This section sets out the Working Party's understanding of the proposals, following consultation on the Issues Paper, but before the IASB considers the Steering Committee's Draft Statement of Principles. The proposals, as understood, form the backdrop to our considerations on the prospect of using fair value-based reporting for prudential solvency purposes. We set out the proposals relatively briefly, notwithstanding that, in a number of cases, the present position was reached after considerable thought and debate.

3.2.2 It is proposed that the accounting standard will apply to insurance contracts (whatever the legal form of the issuing company), rather than to insurance companies. An insurance contract would be defined along the lines of:

> "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 adversely affects the policyholder or other beneficiary (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)."

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The inclusion of the reference to "adversely affects" introduces the concept of insurable interest, and is intended to exclude gambling contracts from the definition. The bracketed exclusion starting "(other than an event" is to avoid overlap with the proposed financial instruments standard — see ¶3.1.3.

3.2.3 Unbundling of contracts into their insurance and non-insurance elements was tentatively proposed in the Issues Paper, but, following consideration of responses received, the Steering Committee decided, in September 2000, that unbundling should not be required in a fair value model.

3.2.4 It is proposed that the unit of account for reporting purposes should be groups of similar contracts (thereby allowing the application of mortality, lapse and other decrements), and that renewals should be included if, and only if, the current contract gives the policyholder potentially valuable options to renew. This approach accepts that allowance for assumed future experience could sometimes result in the calculated value of a liability being less than the current face value of the relevant benefit, e.g. less than the surrender value in the case of a life insurance contract, or the amount of a deposit in relation to a bank account. It should be noted, however, that this aspect of the proposals is not universally accepted. Existing accounting standards incorporate the concept of a 'deposit floor'. The argument is that, as a policyholder has the option to stop paying premiums, the minimum liability has to equal a retrospective policy value (zero for lapses, or the surrender value if one has accrued) that does not take credit for future policyholder actions beneficial to the company. This minimum liability is referred to as the deposit floor, and some interested parties would wish to retain the concept. Should the deposit floor be introduced into fair value accounting, it is not clear how the accounts would be adjusted to mitigate the impact of the increased value placed on the liabilities.

3.2.5 Although, in the Issues Paper, it was suggested that there might be separate standards for long-term and short-term insurances, following consultation, it has been accepted that the same standard should be applied to all insurance.

3.2.6 In the Issues Paper, the Steering Committee considered three different approaches that could be used to account for insurance contracts in the new standard:

(1) deferral and matching, where the prime objective is to associate expenditure with the corresponding revenues; book valuation of assets and deferral of acquisition costs are among the features commonly associated with a deferral and matching approach;
(2) asset and liability measurement on a 'fair value' basis; and
(3) asset and liability measurement on another ('non-fair value') basis.

3.2.6.1 Under an asset and liability measurement approach, the focus is on the measurement of assets and liabilities, with income and expenses being

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defined in terms of changes in the values of those assets and liabilities. No current accounting method is thought to comply with all aspects of a fair value basis. The Working Party understands that Canadian GAAP, Australian Margin on Services and current uses of embedded value methods in the U.K. and elsewhere constitute non-fair value asset and liability methods, while U.S. GAAP and certain of the accounting methods adopted in mainland Europe are examples of a deferral and matching approach.

3.2.6.2 The Steering Committee proposed that the new standard should be on the asset and liability approach, and, if and when financial instruments started to be accounted for on a fair value basis, the standard for insurance should use a fair value basis, since this was consistent with the more general IASB Framework which underlies other IASB accounting standards.

3.2.7 The Steering Committee's starting point in the Issues Paper was naturally the definition of fair value — see ¶1.1.2.

3.2.7.1 For assets (or liabilities) that are traded in a deep, liquid market, fair value would normally be synonymous with quoted market values.

3.2.7.2 However, insurance contracts are not typically traded in this manner, and, in the absence of a deep liquid market, the Steering Committee recognised that determining the fair value of insurance liabilities on a reliable, objective and verifiable basis poses difficult conceptual and practical issues. The Steering Committee is, therefore, developing more specific guidance on measurement issues, and these are expected to be covered within the DSOP. It is expected that the Steering Committee will recognise that an approach based on expected cash flows, risk and present values would provide a general model for estimating a fair value liability, with explicit assumptions being used, rather than a set of implicit assumptions which 'gave the same answer', reflecting up-to-date information, allowing for all future events that may affect the amount and timing of future cash flows.

3.2.8 The Steering Committee took the view that a fair value approach requires that the assumptions concerning future events, risk provisions and discount rates should be those that an independent marketplace participant would make in determining the amount that it would charge to assume an insurance liability, and that these assumptions should be based on the actual characteristics (e.g. underwriting standards) of the portfolio. An alternative (non-fair value) approach would be to use a company's own expectations/assumptions — this is referred to as an 'entity-specific' approach. The two approaches will be discussed in the DSOP, and further commentary is included in Appendix B2. In practice, the distinction between the two approaches is not that clear-cut, and may not be that significant in practice — more a difference of emphasis. For both approaches, observable market prices will be used for assumptions priced in the market (e.g. interest rates and asset returns), and a mix of internal and external information will be used in setting other assumptions (e.g. mortality).

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3.2.9 The value of the liabilities should include an excess over a best-estimate valuation of the liabilities, i.e. a market value margin (MVM) for risk, to reflect the premium that a marketplace participant would demand for bearing the uncertainty inherent in the cash flows. The emerging consensus, with which we agree, is that, in developing a MVM, the market will have regard only to non-diversifiable risks, which reflect the uncertainty in the future cash flows as a result of, for instance, selection of the wrong model or probability distribution for those cash flows. Within any given model, diversifiable risks, e.g. volatility about the mean in mortality experience, would be excluded from the MVM, and hence would not form part of a fair value liability. Both forms of risk would, though, be relevant to solvency capital requirements.

3.2.10 The Steering Committee proposes that, in general, the fair value measurement of the liabilities should not be affected by the nature of, or the return on, the actual assets backing those liabilities. Instead, cash flows (and MVMs) should be discounted using the return on an asset portfolio (termed a 'replicating portfolio' in a note attached to the IAA's response to the Issues Paper) whose cash flows most closely replicate the liability cash flows, including MVMs. Indeed, where the cash flows from the replicating portfolio precisely match the liabilities cash flows, the fair value of the liabilities would simply be the market value of the replicating portfolio. To the extent that the replicating portfolio does not exactly match the liability cash flows, the mismatch risk would be provided for in the fair value liabilities. (Any mismatch between the actual assets held and the replicating portfolio would not form part of the fair value liability valuation, but would be reflected in the supplementary risk-based capital system.) Where, however, the benefits paid to policyholders are directly influenced by the return on specified assets, such as unit-linked or with-profits business, the replicating portfolio would reflect the actual portfolio, in which case discount rates appropriate to the actual investment portfolio would be used. See Appendix B4.1 for further discussion on replicating portfolios.

3.2.11 It is acknowledged that the fair value approach could give rise to a profit at point of sale, to the extent that this reflected an expectation of the economic value generated by a new policy in excess of the value deferred through the use of MVMs. As noted in ¶3.2.4 and Section 3.2.6, this contrasts with traditional accounting practice, whereby such an expectation would be deferred and accrued over the duration of a policy, and with practice in a number of territories worldwide, e.g. the U.S.A. (GAAP) and Australia (Margin on Services).

3.2.12 The question was raised in the Issues Paper, and has been discussed extensively subsequently, as to whether the fair value of liabilities should reflect the insurer's credit standing on the basis that the fair value of most debt would reflect the credit standing of the borrower. Most commentators were strongly opposed to the idea, but it is noted that, in

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respect of the financial instruments initiative, it is proposed that credit risk should be reflected in the value. The Working Party's assessment of the issue and its tentative view are set out in ¶4.11, and, in more detail, in Appendix B3.

3.2.13 The Steering Committee considered that equalisation or catastrophe reserves are not liabilities under the IASB's accounting framework. However, they acknowledged that there may be a need for specific disclosures about low-frequency, high-severity risks, perhaps by segregating a separate component of equity.

3.2.14 For with-profits business, Section 9 brings together the Steering Committee's proposals for general purpose reporting, some discussion on these, and commentary on prudential reporting for solvency for such contracts.

3.2.15 The Steering Committee thought that an embedded value approach would not be appropriate for the new accounting standard. We understand that the main reason for rejecting embedded value methods, at least as currently applied, is to avoid discounting liability and asset cash flows on bases inconsistent with market prices. In addition, it did not favour recognition of embedded value as an asset in the balance sheet, and, instead, considered that an insurer's interest should be reflected in a contract's fair value liability. The IAA, on the other hand, considered that an embedded value approach was an indirect approach, but, nevertheless, was consistent with a fair value approach, if applied in a consistent manner with similar assumptions to more direct methods.

3.3 *Other Views*

3.3.1 Notwithstanding reasonable unanimity between the IASB Steering Committee and the IAA, it should not be supposed that the proposals attract universal support in principle. A number of objections have been raised to some of these basic principles by, or on behalf of, a number of major national accounting and other bodies.

3.3.2 Included among these are views that an insurance contract is more predominantly a service contract rather than a financial instrument, that accounting should be focused on the insurance enterprise rather than on the contract, and that the deferral and matching approach is to be preferred for insurance rather than an asset/liability approach.

3.3.3 The stated bases for these objections to the proposals include doubts that, in the absence of deep, active and liquid markets in insurance liabilities, fair value can be determined in a reliable, objective and verifiable manner. It is also suggested that, since the nature of much of insurance business is extremely long term, to have measurement of its progress dependent on subjective determinations of fair value, will lead to earnings dominated by the effect of assumption changes and a loss, rather than gain, in real transparency and comparability.

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3.3.4 These objections are not insubstantial, and the challenge of them needs to be met by proponents of fair value. It should, though, be noted that a number of these objections are addressed in the Issues Paper and in other responses, and that existing accounting methods also have shortcomings.

4. Fair Values in General Purpose Reporting — Working Party Views

4.1 The Working Party considers that it will be important, from time to time, to remind both financial practitioners and the general public that the term 'fair value' is a technical term, which should not be taken as meaning that, at any given time, the value is, in absolute terms, *the* financially correct value. Even where the fair values of instruments reflect market value in the most liquid and deepest of available markets, such value can sometimes reflect elements of exuberance or pessimism which owe more to group psychological behaviour than they do to a balance of purely financial views and probabilities. Also, market values represent, at any given time, a strike price which is a function of the particular volumes of instruments being traded at the time — it cannot be presumed that the same values would emerge if trading volumes were significantly different, especially if volumes were of a size representing the whole, or even a sizeable portion, of the insurance industry, when limitations of supply and demand would come under extreme pressure. Such recognition of the limitations of the term do not, though, invalidate the use of the concept.

4.2 The Working Party is supportive of the principle of reporting on a fair value/balance sheet-based/prospective valuation basis. Such an approach, if developed soundly, should enhance the transparency, relevance and comparability of reporting, both within and between industries. Such a development would also, we believe, facilitate the insurance industry's efforts to respond to calls for greater transparency, including transparency in the operation of with-profits business — see Clay *et al.* (2001). However, the Working Party sees a significant challenge for the profession and others in converting such an approach from theoretical concept to reality. It will be important to seek a balance between the demands of practicality and adherence to theoretical niceties. Amongst the points of practicality will be the challenge of finding a reporting framework within which the underlying realities are not obscured by overall earnings volatility.

4.3 The IASB's aims for the insurance project (see Section 3.1) are similar to those that led to the development, in the U.K., of achieved profit reporting based on embedded value techniques, namely the shortcoming of traditional methods and the need for a more realistic form of reporting profitability. Although the fair value methodology has some significant differences to embedded values, the Working Party felt that the change from

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traditional to embedded value methods should, in most cases, represent most of the change, at least by effect, from traditional methods to fair values. The more significant differences between fair and embedded value methods include:

— Fair value liabilities are to be independent of statutory (or other) liabilities, being derived directly from projected cash flows of the business. This contrasts with embedded value methodology, that projects the run-off of statutory liabilities and includes investment return on those liabilities in the cash flows.
— Assumptions for future investment returns and rates of discount used in embedded value methods are not always market consistent.
— Under embedded value techniques, as frequently applied, financial options and performance guarantees are implicitly valued as costs on assumed best estimate assumptions. This would result in no cost, even if the options/guarantees were close to biting, and would not be consistent with a market valuation.

Changing embedded value methodology in these respects, to put it on a basis consistent with fair values, should not be an insurmountable problem. For example, options and performance guarantees could be valued as the value of appropriate hedging instruments or by using stochastic methods. Alternatively, they could be valued on a deterministic basis, through allowance for adverse experience, though, in this case, it would be difficult to determine what level of adverse deviation was market consistent.

4.4 A fair value approach is, we consider, highly satisfactory when there is a deep and liquid market in which the instruments being reported upon are traded. Where the deep/liquid market condition does not exist, as is the case for most insurance liabilities, it should, in our view, still be practicable to develop valuation methodology complying with the fair value principle, using cash flow/discounting models, possibly stochastically in some circumstances. Some thoughts on how this might be achieved, in practice, are set out in Appendix B4.

4.4.1 Cash flow models already exist, having been developed for embedded value reporting, to a sufficient standard to use them for financial statements. Stochastic modelling, although carried out by some offices, is not used for company reporting at the current time, and, in this area, further work would be needed to put it on a rigorous and auditable basis, particularly so if deflator methods (see Appendix B6) are to be used. However, these should be temporary issues, with the main questions coming down to the familiar ones of understanding the key features of models and developing the assumptions upon which the models operate.

4.4.2 In some cases, and notably in the assumptions about investment return and value of financial options, it will be practicable to calibrate the assumptions, so as to correspond to market conditions as at the reporting

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date. However, for non-financial risks there is probably no such thing as a market view for such matters as current lapse, mortality (and other risk) and expense assumptions, since these will depend on the experience of the company concerned. Even though, in principle, there could be such a thing as a market view about future trends, in our view it will not normally be possible to know this with any confidence.

4.4.3 This inescapable lack of knowledge does not, *per se*, rule out a fair value-based approach. Assumptions can be developed which are reasonable in relation to general conditions in the relevant markets and economies. Some (mainly financial) assumptions can be set on objective criteria, e.g. having regard to the yield curve at the time, or to the costs of options and other financial instruments for pricing guarantees. Other assumptions (mostly non-financial) will require more exercise of judgement. However, current thinking in the IASB Steering Committee seems to favour allowing entity-specific assumptions for non-financial factors.

4.5 These assumptions will be set and reviewed by practitioners, and the values calculated on the basis of those assumptions will not behave wholly like market values. Once a set of assumptions is established, it will normally only be changed when evidence of a material shift in the relevant rates has become available, whereas markets can change prices by quite small amounts. Thus, assumption sets will change less frequently than the market shifts prices, and, when they are changed, the change will often have a material effect. This needs to be understood and accepted.

4.6 The issue of who makes the assumptions is important. There is value in having the decisions made by individuals familiar, in each case, with the circumstances of the reporting entity. However, the range of opinion that may properly be held as to the appropriate set of assumptions would, we believe, often be material in terms of its effect on the reporting entity's results, thereby, to some extent, undermining comparability of results as between reporting entities. This is not a new phenomenon, applying as it does to other realistic reporting methods. A case could be made for setting up a centralised entity, probably one in each relevant reporting jurisdiction, which could act so as to reduce this variability. We attach, in Appendix B1, a note discussing what we have termed an Actuarial Standards Board, including some discussion on the pros and cons of such an entity. We recommend that debate takes place as to the desirability of such a body.

4.7 Operation of the models for estimating fair values and the methods used, although not posing any problems of principle, will be complex and time-consuming, requiring considerable and generally expensive expertise. Through the involvement of actuaries, such expertise will generally be available where the use of fair values in respect of insurance reporting is concerned.

4.7.1 The view may be taken that the use of complex models will penalise smaller companies which cannot justify the cost. However, a counter argument would be that companies which cannot afford to measure

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complex risks properly should be discouraged from assuming those risks in the first place. It is also worth noting that not all risks require the most elaborate (and expensive) tools for their control.

4.8 The concept of the replicating portfolio (see ¶3.2.10) is convenient in principle, but such portfolios may prove difficult to identify in practice — see Appendix B4.

4.9 The Steering Committee's proposals include paying no regard, in setting fair value, to any mismatch between the replicating portfolio and actual assets held. We accept, for the needs of general purpose reporting, the Steering Committee's thinking, but regard it as important that the market be made aware, through appropriate disclosure within general purpose reporting, of any mismatch.

4.10 The concept of the MVM within the fair value of a liability is fine in theory, but its quantification will often be questionable. Being the difference between best estimate and current market-level valuations of the liability, it suffers from the inherent unknowability of the best estimate valuation. Ultimately, however, we do not see the fair value approach depending on the need to separately quantify best estimate and MVM. We consider that a reasonable quantification of market value should be attainable to acceptable standards, even in those uncertain situations where the liability is infrequently, or never, traded in practice.

4.11 It is the Working Party's view that, if accounting standards permit allowance to be made for the credit standing of the reporting entity, then this should apply only to debt issued by the company and not to its insurance liabilities. This view was reached on the grounds that, whereas settlement of own debt could reasonably be expected on terms reflecting own credit standing, the transfer of insurance liabilities to a third party would break the dependence of those liabilities on the reporting entity, and so it is unlikely that the terms of the transfer would reflect that entity's credit standing. Appendix B3 provides a more detailed discussion on own credit standing.

4.12 The Steering Committee has discussed, at some length, whether a market-specific or an entity-specific approach should be taken to valuation. As developed in Appendix B2, our view is that valuation should take account of entity-specific circumstances (e.g. underwriting standards, service standard expectations of its clients, socio-economic profile of its client base, etc.) while, as far as possible, making assumptions for the future (inflation, macro-economic effects affecting lapses, medical advances, *et al*.) which are market-based. For example, some regard might be paid to such market benchmarks as the expense charges that might be made by a third-party administrator, but only where it is reasonable to suppose that transfer of administration to such a body could take place. The Working Party expresses no view as to whether such an approach is properly describable as a fair value or a non-fair value approach, though we feel that the former would be preferable.

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4.13 The Working Party considers that the insights obtained by the Fair Values Calculation Group, in their work which is summarised in Appendix C, throw a valuable perspective on a number of practicalities. Included within Section 11.2 (Further Work) are several items which represent a follow-up to issues identified by the Group.

5. Prudential Supervision — Current Trends in Thinking

5.1 *Introduction*

5.1.1 The proposals outlined in Section 3 should, if generally adopted, lead to more consistent financial statements for life insurance companies around the world. These will report the amounts of capital which companies have available to support the risks that they are assuming. Most states also set prudential limits as to the minimum levels of capital which insurance companies must maintain if they are to continue in business.

5.1.2 At present these prudential requirements vary significantly from country to country, even within the E.U. where some degree of harmonisation is required by E.C. Directives. Also, in many countries prudential standards are set independently of general financial statements, and are not easily reconciled to them. There are a number of consequences:

— Comparisons of financial strength and solvency between companies in different countries are difficult.
— Regulatory arbitrage between countries is encouraged.
— These drawbacks may be expected to become more significant, due to the global consolidation of life insurance companies.

5.1.3 Regulatory arbitrage can also arise as a result of the convergence between insurance products and banking products. Products with identical financial characteristics may have significantly different capital requirements, depending upon the type of legal entity which issues them.

5.1.4 As a consequence of the above, regulators, internationally, are seeking to harmonise prudential supervision, both between countries and between different types of financial institutions. The development of fair value reporting for insurance contracts (and similar developments for financial instruments) is both encouraging and facilitating these developments. In this section we consider briefly the following:

— the Financial Services Authority's (FSA) approach to regulation of U.K. financial institutions;
— the work of the International Association of Insurance Supervisors (IAIS) to develop international standards for insurance supervision;
— some proposals from the International Actuarial Association; and
— the New Basel Capital Accord development by the Basel Committee on banking supervision.

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5.2 *The Approach of the FSA*

5.2.1 The FSA will be responsible for the regulation of all U.K. financial institutions and, in particular, for the prudential supervision of insurance companies, banks and investment companies. Its stated intention is to develop a rigorous, risk-based approach to supervision, which will be consistent for all financial institutions, so that like risks will be met by a like response, unless either there is a good reason for making a difference, or international obligations prevent harmonisation. The *Integrated Prudential Sourcebook* (FSA, 2001a), which is expected to come into force in 2004, will take a risk-by-risk approach to setting prudential standards.

5.2.1.1 The risks considered are:

— credit risk;
— market risk;
— operational risk;
— insurance technical risk;
— liquidity risk; and
— group risk.

5.2.1.2 It is intended that, for insurance companies, there will be greater emphasis on risk identification and management rather than on adequacy of technical provisions and solvency margins.

5.2.1.3 These proposals are set out in detail in FSA Consultation Paper 97 — *The Integrated Prudential Sourcebook*.

5.2.2 The FSA's approach has regard to international developments in prudential supervision, such as the 'three pillars of supervision' developed by the Basel Committee (see Section 5.5), which it considers to be equally applicable to the supervision of insurance companies. It is proposed to require all insurance companies to make their own assessment, on reasonable assumptions, as to the capital that they need to meet the risks of their business. This will be seen to be a key responsibility of management.

5.2.3 This emphasis on internal risk assessment is in line with more general developments on corporate governance, such as the Turnbull requirements on the reporting of risk. In the case of insurance companies, particularly life insurance companies with long-term liabilities, it raises significant challenges for actuaries and regulators.

5.2.4 The FSA is also having regard to the development of international accounting standards for insurance contracts and financial instruments. These will allow a consistent definition of capital for different types of financial institutions in different companies, and so will provide a basis for consistent prudential capital standards.

5.3 *The Work of the IAIS*

5.3.1 The IAIS brings together insurance regulators worldwide. In December 1999 it produced an issues paper (IAIS, 1999), which discussed the

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general principles on capital adequacy and solvency as laid down by insurance supervisors. It is understood that they intend to develop these ideas with the aim of developing an agreed international standard for risk-based capital in the prudential supervision of insurance.

5.3.2 The IAIS paper accepts that the various existing solvency regimes could be improved to a greater or lesser extent. It proposes that, for insurance companies, four pillars of solvency should be considered:

— *Risk management* — an assessment of risks, including both current risks and the management of future business plans and associated risks. The paper sets out a possible structure of risks. An insurance company's own internal risk assessment and management processes are an essential part of a solvency regime.
— *Minimum solvency requirements* — which set a required minimum margin or control level reflecting the risk assessment.
— *Solvency assessment and supervisory review* – both a company's management and the supervisor should be able to assess the solvency position.
— *Disclosure of information* — so that third parties can form a view on a company.

5.3.3 The paper identifies a key role for actuaries (and also for mathematicians and economists with insight into, and experience of, insurance business) in the assessment of risk and the determination of solvency margins and technical liabilities. It is noted that deregulated markets place particular demands on the actuarial profession, and often lead to effective solutions along the lines of the Appointed Actuary system.

5.4 *The Proposals of the IAA*

5.4.1 The IAA discussion paper (IAA, 2000b) sets out an overview of possible approaches for the valuation of insurance liabilities in the context of the IASB insurance project, and, as regards prudential supervision, a basis for determining the economic capital requirement on a risk-adjusted basis.

5.4.2 Economic capital requirement is defined as the capital needed to protect against a change in the value of a business (fair value of assets less fair value of liabilities), such that the likelihood of insolvency over a given period is less than a specified confidence level. The calculation of the economic capital requirement should take account of all the risks to which the company is exposed.

5.4.3 Deviations in the value of a business over a period will result from changes in the cash flows during the period and/or changes in the expectation of future cash flows. Thus, the impact of the changes in the cash flows, relative to the best estimates plus MVMs, determines the level of economic capital required. In total, the economic capital requirement needs to be sufficient to absorb all adverse deviations with a high probability.

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5.4.4 In effect, those parts of the risks which have not been included in the fair value liability are taken into account in the calculation of the economic capital requirement. These risks reflect uncertainties in setting assumptions, uncertainties with respect to the distribution functions of the risk factors, and the volatility in the risks (to the extent that they are not allowed for in the MVM). Eight major risks are considered in the IAA paper — see ¶6.5.2 for details.

5.4.5 To determine the capital required for each risk, the impact of the net change in the fair value of assets less liabilities must be assessed separately, with uncertainties and volatilities being considered for each. The measurement of these risks requires extensive data and development of models, and this is discussed further in Sections 6.3-6.6.

5.5 *The New Basel Capital Accord*

5.5.1 The New Basel Capital Accord proposes a new capital adequacy framework for banks. Its proposals are likely to influence the supervision of other types of financial institutions (for example, see comments in ¶5.2.2). The new framework is intended to align capital adequacy assessment more closely with the key elements of banking risks, and to provide incentives for banks to enhance their risk measurement and management capabilities.

5.5.2 The Capital Accord emphasises the importance of the three pillars of the new framework (not to be confused with the four pillars of the IAIS, although they cover similar ground):

— the first pillar, minimum capital requirements;
— the second pillar, a supervisory review process; and
— the third pillar, effective use of market discipline.

5.5.3 The minimum capital requirements will, for the first time, include specific requirements for operational risk. The Accord also proposes a revised approach for calculating credit risk capital. Market risk capital requirements are covered under separate amendments to the old Accord, and have not changed. The Accord proposes an evolutionary approach to setting minimum capital requirements for operational and credit risks. This seeks to motivate banks to improve their risk management and measurement capabilities, and allows the use of more risk-sensitive methodologies, and thus more accurate capital requirements.

5.5.4 At the most basic level will be a standard approach. For credit risk, this will follow the current approach, where assets are assigned risk weights. It is, however, proposed to base those risk weights on external credit assessments. For operational risk there will be a basic indicator approach, which will link the capital charge for operational risk for the entire organisation to a single indicator of risk exposure, for example gross income, and a standardised approach, which will follow a similar approach, but be applied to individual business lines.

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5.5.5.1 As an alternative to these standard approaches, banks will have the option of an approach to regulatory capital which more accurately reflects a bank's individual risk profile. In the case of credit risk, this is referred to as the internal rating-based (IRB) approach. IRB credit risk factors would be developed based on the probability of default (PD) and loss given default (LGD) for each borrower. PDs will be estimated by each bank, but there will be two levels of IRB, a foundation level for which prescribed LGDs will be used, and an advanced level for which LGDs will be determined by the individual bank. Similarly, for operational risk, it will be possible for banks which meet appropriate supervisory standards to use an internal measurement approach which relies on internal data.

5.5.5.2 The regulators clearly expect internationally active banks to move quickly to develop and implement these more advanced approaches.

5.5.6 The second pillar, supervisory review, is intended to ensure that each bank has sound internal processes in place to manage its risks and to assess the adequacy of its capital, based on a thorough evaluation of its risks.

5.5.7 Finally, the third pillar, market discipline, emphasises the need for effective disclosures by banks, to inform market participants, so as to facilitate effective market discipline. Since internal methodologies will have a significant influence on the level of capital, it will be important for market participants to understand the relationship between the risk profile and the capital of an institution.

6. Fair Value-Based Prudential Reporting — Basic Principles and Risk-Based Capital

6.1 *Introduction*

6.1.1 In this section we consider prudential or solvency reporting within a fair value framework. We propose some basic principles which any system of prudential reporting should meet, and which broadly reflect, the trends in prudential supervision discussed in Section 5. We consider a system based on the fair value of liabilities together with additional risk-based capital requirements. These proposals are developed in later sections, and the specific issues raised by U.K. style with-profits business are considered.

6.1.2 If a company (of any type) had assets sufficient only to meet best estimates of its future liabilities, then these assets would be sufficient only about 50% of the time. This is generally regarded as inadequate for financial institutions, which will, accordingly, hold capital in excess of best estimate liabilities, so as to reduce the risk of failure to an acceptably low level. This capital requirement could be specified either as margins in the liabilities or, explicitly, as a solvency margin. If the total amount of this capital requirement is determined in a (more or less) scientific way, having regard to

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the risks to which the business is exposed, so that the level of required capital can be related to risks of default or ruin, then we will describe this as a system of risk-based capital (RBC). It should be noted that this definition goes beyond the more formulaic definitions of RBC which are used in some countries. Some initial work on RBC in the U.K. context was carried out by the Hylands working party (Hylands *et al*., 1993). However, in the context of fair value accounting, it has seemed appropriate, with the benefit of the Hylands *et al*. work, to consider from first principles the risk-based approach to prudential reporting.

6.1.3 It is helpful to distinguish according to whether RBC is specified externally or otherwise determined:

— *Regulatory capital*. This is the capital prescribed by regulators which must be held to satisfy the law. Other external parties, such as rating agencies, may also specify minimum capital requirements for companies if they are to achieve a desired rating.

— *Economic capital requirement*. This is the capital requirement which a company calculates internally (or an external analyst estimates from publicly available information), taking account of all risks (business and operational, as well as financial) and allowing for any natural hedges between risks, which will allow it to meet its obligations, with a specified level of confidence, over a defined time period. Thus, the FSA requirements, described in Section 5.2, will be an assessment of economic capital requirement.

6.1.4 In an ideal world, regulatory capital would be equal to the economic capital requirement (at least for a given ruin probability). This is unlikely in practice, as the calculation of regulatory capital will usually make simplifying assumptions to allow for risks. Nonetheless, regulatory capital serves the same purposes as economic capital requirement, and the same principles should underlie its determination.

6.2 *Some Basic Principles*

6.2.1 The Working Party proposes the following six principles.

6.2.1.1 Under the fair value approach, liabilities are not best estimates, but include market determined margins. However, it seems likely that market value margins would not represent adequate prudential margins for solvency, and so *additional provisions* will be required to be made, either by including further margins in the calculation of the liabilities (so increasing the liabilities), or by setting specific requirements for capital in excess of the fair value liabilities which have been calculated for general purpose reporting.

6.2.1.2 However these additional requirements are expressed, it is important that they are *transparent*, so that customers, rating agencies, other industry commentators and regulators can easily make informed

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judgement as to the relative solvency positions of different companies. This requires adequate disclosure of the risks which companies are assuming, and the provisions which they have made to cover these risks. These should be disclosed in the financial statements, as they are a natural extension of current developments, such as the Turnbull requirements. Such transparency is a key 'pillar' of the proposed solvency regimes discussed in Section 5.

6.2.1.3 As far as is possible, a system of prudential supervision should operate a *level playing field* for capital requirements in different types of companies. The same risk should be treated in the same way, and should lead to the same capital requirements, regardless of the legal form of the institution assuming that risk. This will minimise the scope for regulatory arbitrage between different types of institution, in the same way that consistent international standards will reduce arbitrage between different countries.

6.2.1.4 A system of prudential supervision should *encourage and reinforce good management practice*, in particular good risk management practices, and should reflect actions to reduce risk in setting capital requirements. This implies that capital requirements should be set having regard, in some detail, to the risks assumed and the controls to manage risks, rather than by applying mechanical formulae.

6.2.1.5 The determination of capital requirements should have appropriate regard, *inter alia*, to *actual backing assets (and how well they match the associated liabilities),* and to *options available to policyholders*. To the extent that assets do not match liabilities, it would generally be expected that the higher the level of risk attaching to assets, the greater the capital requirement would be, notwithstanding any higher potential return.

6.2.1.6 It is expected that regulators will set a *series of trigger points*, which will act as warning signs if capital falls below defined levels. This will facilitate orderly and gradual intervention in the affairs of a company. One way to achieve this would be for each company to set, internally, an appropriate capital buffer above its regulatory capital requirements, and to notify the regulator if this is breached. Such an approach is being introduced for U.K. banks. (See FSA, 2001b.)

6.2.2 The practical implementation of these principles is a difficult challenge, but seems most likely to be achieved in a framework which starts with fair value of liabilities, and then sets required levels of solvency capital. Thus, fair value general purpose financial statements define the amount of capital available for all types of institutions, and prudential standards set the minimum level of capital which is required. If this risk-based capital is set to be close to true economic capital requirement, as defined in ¶6.1.3, then consistency between different types of institution should be achievable.

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6.3 *RBC in a Fair Value World*

6.3.1 The IAA paper referred to in Section 5.4 sets out a theoretical framework for RBC. It defines risk to be: "deviations of the fair value of assets and liabilities due to differences between expectations and realisations of the various factors which affect cash flows". In practice, only adverse deviations are relevant. The sources of deviation are classified as:

— *uncertainty* in the best estimate assumptions; and
— *volatility* of actual experience around the true best estimate.

6.3.2 Fair value liabilities comprise, in principle, best estimate liabilities plus a MVM. Thus, part of a company's capacity to absorb risk is held within the fair value liabilities. Additional explicit RBC is required to cover uncertainty risk at a higher confidence level, and to cover, to a defined level, volatility risk and asset mismatching not allowed for in fair value liabilities. As noted in ¶3.2.12, fair value liabilities may reflect the credit standing of the company. If this is the case, then RBC will also be needed to remove this adjustment, as it is not appropriate for the purposes of prudential supervision.

6.3.3 Thus, the relationship between fair value liabilities used for general purpose reporting, as discussed in Section 3, and RBC can be summarised as:

Assets equal to:	Probability of meeting liabilities:
best estimate liabilities	about 50%
best estimate liabilities + MVMs = fair value liabilities	a probability which would be the result of market forces, changing from time to time, and which may lie somewhere in a range of, say, 55% - 80%
fair value liabilities + explicit RBC	95% plus, across the lifetime of a portfolio. The IAA has proposed a higher standard, as described in ¶6.5.1.

The probability that the fair value liabilities will be sufficient will depend upon the market value margins, and so will vary over time, as the market becomes more or less risk averse. The level of adequacy for fair value liability plus RBC will be set by management (for internally calculated RBC), and we suggest should be prescribed by regulators for regulatory capital.

6.4 *Calculation of RBC*

There seem to be two main approaches to calculating RBC (other than arbitrary rules of thumb).

6.4.1 *The building blocks approach*

6.4.1.1 The total RBC requirement is built up by applying defined

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factors to individual measures of risk, such as sums insured, reserves and asset values. These individual blocks are aggregated, sometimes with an allowance for covariances between risks, to give the total capital required.

6.4.1.2 This is the most common way of specifying regulatory capital for insurance companies, being used, for example, in the E.U., U.S.A., Canada and South Africa. It was also the method examined by Hylands *et al.* (1993). It has the benefit of simplicity, but can allow only crudely for the level of risk, and often not at all for margins in liabilities.

6.4.1.3 It should be noted that the IAIS paper (IAIS, 1999) defines RBC as capital calculated in this way. This seems far too narrow a definition.

6.4.2 *Probabilistic methods (including stochastic modelling, value at risk, stress testing)*

6.4.2.1 These methods seek to model statistically the principal risk factors which affect cash flows, and then to model the variability of cash flows, so that the level of capital needed to satisfy a given solvency level can be determined explicitly. Examples are value at risk (VaR) models, used by banks to measure market risk; and stochastic asset/liability models, used by some insurance companies to determine capital levels and asset mix for with-profits funds. Some large banks and international insurance groups are known to be developing more comprehensive models, to allow them to allocate their economic capital requirement consistently across all their lines of business.

6.4.2.2 This approach may be too complex to be used at present by regulators as the sole way of determining RBC. However, it should be noted that the Basel Committee is proposing that banks should be allowed to use internal VaR models to set capital requirements for market risk.

6.4.3 Any system of RBC for regulatory purposes will need to strike a balance between a simple formula-based approach, which is easy to define and implement, but is crude in its application, and more sophisticated modelling approaches, which are complex to specify and to implement. A possible approach would be for regulators to specify a hierarchy of methods. This could start with a simple formula driven method, perhaps set by regulators carrying out stochastic modelling, which would have to err on the cautious side in setting capital levels for a given risk. As an alternative to this, companies which were able to develop models meeting specific standards would be able to use these models to derive capital levels which more accurately reflected the risks assumed. This would encourage companies to develop more accurate methods of pricing and managing risks. It could be argued that this would penalise companies which do not develop sophisticated models, but a counter-argument is that companies which are not capable of accurately measuring complex risks should be discouraged from assuming those risks in the first place.

6.4.4 A challenge to the development of risk models for the purpose of

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determining RBC is that RBC is concerned with the extreme tail of the distribution. Validation of the tail of such distributions is hampered by the unavoidable fact that, in comparing the model with real life, actual examples of 'the tail' are, by definition, few.

6.5 *Summary of IAA's Proposed Approach to Determining Economic Capital Requirement*

6.5.1 The IAA proposes that the economic capital requirement should be sufficient to absorb all adverse deviations in cash flows with a high degree of certainty. 99.95% is suggested, although this seems very high, and it is unclear what time period should be considered.

6.5.2 Each risk to cash flows needs to be separately analysed to make it measurable, transparent and manageable. Eight major risk types are considered:

— credit risk;
— transfer risk;
— market risk;
— business risk;
— operational risk;
— mortality risk;
— morbidity risk; and
— property and casualty risk.

Many alternative classifications of risk are possible — see Appendix B5 for further discussion on this.

6.5.3.1 It is proposed by the IAA that the capital for each risk type should be considered separately, and that these risk types should be modelled allowing for:

— uncertainty, by considering trends in rates of occurrence in historic data; and
— volatility, either by an empirical approach from historic data, or by assuming a probability distribution (presumably calibrated on historic data).

6.5.3.2 Whilst setting capital separately for each risk will simplify the calculations, the Working Party considers that this could lead to excessive capital requirements, as no account will be taken of any natural hedges between risks which are not fully positively correlated.

6.5.4 The IAA suggested that the models required to achieve this would not generally be company specific, although company specific adjustments, for example, for underwriting policy, might be needed. Reference is made to methodologies developed for banking which could be applied in insurance — these include methods for credit risk, transfer risk, market risk, business risk and operational risk.

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6.5.5 The time horizon for the determination of ruin should be either:

— the minimum time at the end of which the company can raise any new required capital;
— the time at the end of which the company can close outstanding risk positions by sale, hedging or reinsurance; or
— the time necessary to run off the liabilities for existing business.

The last of these is likely to be most appropriate for prudential reporting for a life insurance company, and is considered further in ¶6.6.5.

6.6 *Issues with RBC*

A robust system for determining RBC seems essential if fair values are to be used as the basis for solvency demonstration as well as for financial reporting. There are many conceptual and practical issues to be resolved, including the following.

6.6.1 Is risk of ruin the correct measure to determine RBC, or should RBC take account of both the probability of ruin and the expected shortfall if ruin occurs, i.e. the expected cost of ruin, rather than just the risk of ruin? Whilst the expected cost of ruin has some theoretical benefits (it is similar to the premium to be charged by a guarantee fund), risk of ruin seems to be more practical to implement.

6.6.2 If risk of ruin is to be adopted, is it possible to set absolute ruin probabilities, regardless of economic conditions? The IAA suggests expressing ruin probabilities in the terminology of rating agencies, but some rating agencies maintain that their ratings of insurance companies are only relative, and that the absolute risk of ruin corresponding, say, to an A rating will vary with economic circumstances.

6.6.3 To what extent is it reasonable to allow for management actions in modelling the probability of ruin? This is fundamental to the operation of with-profits business; stochastic models of with-profits funds often show alarmingly high ruin probabilities because of inadequate modelling of management actions in adverse scenarios, and simple models can give counter-intuitive results. Will it be possible to agree, and model, an acceptable range of management actions? This and other issues specific to with-profits business are considered in Section 9.

6.6.4 Who should have the task of setting ruin probabilities corresponding to prudential risk-based capital requirements? The Working Party considers that this should properly fall to the regulators. Considerations to be borne in mind in setting a suitable figure would include: striking a balance between the natural desire to protect the insurance-buying public against the consequences of default; and the need to ensure that companies are not deterred from providing desirable insurance services by too extreme a capital requirement. Also, in the early years of such a new risk-based capital system, we believe that it would be reasonable to avoid too

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abrupt a change between the capital requirements implicit in the current regime and those in the replacement regime.

6.6.5 Over what timescale should the risk of ruin be measured? This is a key point. Banks usually use very short time scales, being those over which it would be possible to close out risks. It may be that a relatively short time period, of, say, one to three years, could also be used for insurance business, it effectively being assumed that the business could be closed out at fair value of liabilities, and that modelling would show the sensitivities of fair value over such a period. However, given the long-term nature of some insurance business and the practical difficulties of transferring the business, the majority of the Working Party is of the view that the time scale should be the period of run-off of the existing portfolio, which could be a period of a number of decades. The time period chosen will influence both the definition of ruin and the choice of ruin probability.

6.6.5.1 For instance, if solvency is being tested over the period of run-off of the existing business, then it needs to be decided whether ruin is defined by insolvency at the end of the period or at any intermediate point.

6.6.6 If a stochastic projection is used to set required capital levels, either directly or in the calibration of regulators' formulae, then what should be used as a definition of ruin? One possibility, which may be the most logical, would be to define ruin as occurring when all assets have been exhausted, but some liabilities remain, i.e. with no intermediate test of solvency before total ruin. An alternative would be to set an earlier test of solvency, such as fair value of assets less than fair value of liabilities, so that ruin is deemed to occur if this test failed at any time in a scenario. Again, the prescribed ruin probability will need to take account of the definition of ruin.

6.6.7 Should the calculation take account of new business? For the public reporting of the solvency position, it would be reasonable (and consistent with current practice) to exclude new business. However, for a more general internal assessment of capital adequacy, new business in line with the company business plans should be included.

6.6.8 To what extent will it be possible to agree standards so that internal models used for determining economic capital requirement can be accepted by regulators? There are moves towards this in banking through use of VaR models, but insurance companies, with their more complex asset/liability interactions, seem to set more difficult problems. This is likely to be a particular problem for solvency testing, with very low probabilities of ruin at the extreme tail of the distribution — see ¶6.4.4. Nevertheless, the Working Party considers that the use of internal models coupled with ongoing dialogue with regulators will allow ongoing best practice to be fed back into general use. Further development and refinement of methods will be necessary for some years (at least), before a final robust set of standards can be said to have been achieved.

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6.6.9 How should some of the more contentious areas of fair value accounting, such as own credit standing (see ¶3.2.12 and Appendix B3) and deposit floor (see ¶¶3.2.4 and 3.2.11), be allowed for? There seems little case for own credit standing of liabilities at least for insurance liabilities. In any event, an RBC approach, as proposed above, would simply increase the level of RBC to offset the reduction in liabilities. In the Working Party's view, there seems to be more of a case in the context of prudential reporting for applying a deposit floor minimum — see ¶8.9.1.

6.6.10 Should it be possible, in principle, for RBC to be negative where a contract can absorb some of what would otherwise be proprietors' risks, for example for certain forms of with-profits business with large non-vested liabilities? Comment on this is provided in Section 9.

7. Fair Value-Based Prudential Reporting — Investment-Related Risks including Financial Guarantees

7.1 Investment-related risks will arise from imperfect matching of assets to liabilities, where imperfection of matching includes:

— mismatching liabilities and assets by type, e.g. non-linked liabilities with equities;
— mismatching non-linked liabilities by term and/or by credit rating;
— not hedging investment guarantees, or hedging guarantees using derivatives that only approximately match the underlying guarantees (for example matching guaranteed annuity options using a portfolio of swaptions); this would significantly reduce investment risks, but not eliminate them; and
— hedging guarantees using a dynamic hedging strategy that mimics the underlying guarantees, but that still leaves the office vulnerable to jumps or falls in equity prices.

7.1.1 In what follows, attention is primarily paid to what is termed 'market risk'. Default risk can also be significant, and is often allowed for by setting maximum (admissibility) limits on exposures by counter-party. It could be argued, though, that such an approach would still leave insurance companies open to systematic risk (i.e. the risk of a single default causing a chain of defaults throughout the market). Incorporating probabilities of default into stochastic models would not be straightforward, and, furthermore, may not prove any better, in practice, than appropriately-set counter-party limits.

7.2 *Methods of Determining RBC*

The Working Party is of the view that a simple building block approach to determining RBC would not be as suitable as a probabilistic approach,

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when considering investment-related (market) risks. There are two main approaches to implementing a probabilistic approach:

— stress testing; and
— stochastic modelling;

and these are considered below. Both methods are used in the banking world in determining VaR, and both could play a part in future solvency reporting.

7.2.1 *Stress testing*

7.2.1.1 Under the stress testing approach, companies are required to hold enough extra capital to be able to survive each one of a set of stress tests. Each stress test is a what-if scenario, where the effect of specified changes in investment conditions on the market value of assets and on the fair value of liabilities is to be determined.

7.2.1.2 Examples of the use of the stress testing approach are:

— the resilience tests specified by various international insurance regulators; and
— the SPAN tests used at LIFFE to determine margin amounts that dealers need to deposit with the London Clearing House.

7.2.1.3 The quality of the results of applying stress tests is only as good as the quality of the tests themselves. It is, therefore, important that the tests are chosen carefully to begin with, and regularly updated thereafter, as investment conditions change. LIFFE, for example, updates its tests every day. However, the specification of tests is not easy. For example, the Resilience Reserve Working Party encountered great difficulty in designing a set of tests appropriate for the calculation of life office resilience reserves. Issues to be considered include the extent to which currency fluctuations and changes in the shape of yield curves should be allowed for.

7.2.1.4 Stress tests only indicate what would happen in the particular specified scenarios, and say nothing about the probability of those scenarios occurring. A set of required tests would, however, ideally include some features related to past events from real life, for example the market movements experienced in 1974, 1987, 1998 and/or September 2001. It is recognised, though, that the use of past events is, at best, a partial solution to the design of stress tests, due to the difficulty of knowing at any time how these 'troughs' relate to current market conditions and the near-certainty that future difficult times will be different to the past.

7.2.1.5 Finally, since only a limited number of tests can be specified, it is possible that the aggregate effect of the tests could bear unevenly on different companies, and not necessarily in proportion to the risks being run. This might particularly be the case for companies whose business was in some way 'untypical', and for whom the specified tests did not adequately

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cover the key risks. Such a situation could be addressed by presenting the prescribed tests as a minimum set to consider, with the requirement that companies also considered other relevant scenarios.

7.2.2 *Stochastic modelling*

7.2.2.1 The Working Party, in principle, would encourage the use of stochastic methods for the determining of RBC in respect of investment-related (market) risk (but see comments in Section 7.3). The use of stochastic methods avoids some of the difficulties described above, associated with the use of a limited number of specified scenarios, and has the advantage that RBC requirements can be calculated at a variety of significance levels. In addition to allowing for any interaction between liabilities and investment conditions (e.g. financial guarantees), such methods can also model any intended interaction between asset choice and investment conditions (e.g. reflect the position where an insurance company intended to follow a dynamic hedging strategy).

7.2.2.2 While the choice of stochastic model for fair valuation calculations is important, for RBC determination the choice is even more critical. A model that is suitable for fair value calculations may not be appropriate for RBC. For example, a lognormal model for equities might be adequate to calculate fair values, but might fall short for RBC by understating the probability of extreme events. More refined models do exist that attempt to match the distribution of extreme events more accurately, for example regime-switching models (Hibbert *et al*., 2001) or models that incorporate price jumps.

7.2.2.3 Once the structure of the model is decided upon, its calibration (i.e. the setting of assumptions regarding yield, risk premium, volatility, etc.) then has to be addressed. This is not a one-off exercise, but needs to be re-visited regularly, as market conditions and long-term expectations change. As with the setting of stress tests, the extent to which past history is relevant to the setting of prospective assumptions needs to be carefully considered. Another factor to note is the possibility that, due to market conditions current at the time, the calibration appropriate for solvency assessment may be different to that for fair value calculation.

7.2.2.4 The interaction of liabilities with investment conditions gives rise to a number of issues. The case of future bonus rates is covered in Section 9. Where guarantees (in respect of, say, surrender values) exist at certain dates, a decision needs to be made regarding the possible extent of take-up of the option. While assuming 100% take-up may be too prudent, some allowance should be made for increased lapses in situations where the guaranteed value was greater than the policy's fair value.

7.2.2.5 The demands of stochastic modelling on computer requirements will tend to be more material in calculating RBC than fair values. For calculating RBC, an insurance company will be closely examining the tail of

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a probability distribution rather than calculating its mean (deflated) value, and so will need to see enough examples of the tail to be able to draw statistically significant conclusions. Using current methods, this will require many more runs, and it will be necessary to consider the trade-off between speed and accuracy in deciding exactly how many runs need to be performed. It remains to be seen whether methods can be developed which enable those simulations that are clearly non-threatening to a company to be quickly disposed of without going through a full projection process.

7.2.2.6 The issue of calculation time would arise, particularly, were it to be necessary to check solvency at intermediate points during the calculation of RBC. Since fair values are, themselves, based on stochastic runs, this could mean performing runs within runs, so increasing the total number of runs required. Approximate methods would, therefore, need to be found to estimate fair values if intermediate solvency checks are to be carried out. As already mentioned in ¶6.6.5.1, an alternative methodology would be that of projecting until all policies went off the books, and assessing solvency only at the end of the period.

7.3 *Future Challenges*

7.3.1 Notwithstanding the existence of certain stochastic engines, notably the Wilkie model, for a number of years, further investigation and development is needed into the ability of models to replicate what happens at the 'tail' of the distribution, which is the area of greatest interest for the purpose of establishing solvency criteria, before the probabilities associated with extreme scenarios can be given practical credibility.

7.3.2 A market value represents the price at which a buyer and seller are prepared to settle in a particular set of circumstances. Where issues of supply and demand affect this equilibrium, it is possible to envisage situations where *actual* risk and *perceived* risk (as implied by the market price) were to differ. From the point of view of general purpose reporting, it may be adequate to rule out such arbitrage opportunities by taking the view that the perceived risk is the 'correct' one to use. For prudential solvency reporting, however, attention would need to be paid to such possibilities, which has implications for the design and calibration of any stochastic model used for the derivation of the amount of RBC which should be held.

7.3.3 Nevertheless, use of such models is, we consider, capable of resulting in prudential capital requirements, which are superior to those derived from present methods in meeting level playing field requirements and appropriately rewarding (with reduced capital requirements) good risk management practices.

7.3.4 From time to time, notwithstanding the best efforts of monetary and other authorities, it is likely that the market will suffer periods of such substantial turbulence (for example as happened in 1974) that large numbers of insurance companies find that they become technically insolvent. Such

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periods represent a major challenge to the regulators, in which action taken can have consequences of the gravest effect, for good or ill, for companies and their customers, with, perhaps, the key question being which companies to put into a closure management situation and which to allow to continue with investment and other policies which optimise the prospects of the companies benefiting from any market recovery. At such times, the availability of the results of stochastic simulations should represent a powerful resource for regulators, enabling them, for example, to enquire of insurance companies what the combinations of circumstances are in which they would be technically solvent. This would give the regulators a better idea of where the biggest problems were.

8. Fair Value-Based Prudential Reporting — Non-Financial Risks

8.1 This section considers non-financial technical risks, and how they might be reflected in a new solvency standard, defining a risk-based capital requirement to be layered on top of a fair value liability. Such a standard would define the amount required to meet liabilities to a given high confidence level, and the risk-based capital requirement would be determined as the excess of that amount over the fair value liabilities. The section also considers allowance for operational risk in such a standard.

8.2 In theory, it should be possible to determine a risk-based capital requirement in respect of non-financial assumptions, using stochastic methods based on best estimate assumptions and assumed distributions about that expectation. Development of such a methodology would, however, set significant challenges, as stochastic models have not, to the Working Party's knowledge, been widely used for non-financial risks, at least in the U.K. Those models that do exist would need to be researched, any new models required would have to be developed, applicable probability distribution functions and parameters determined, and a track record of credible results produced over a reasonable time period. This work would need to be to a high quality in order to build a rigorous and robust solvency standard, and so should not be underestimated.

8.3 For some elements of future experience relevant to insurance business, the uncertainty attaching to a best estimate assumption would be expected to justify a higher level of solvency capital than would stochastic variations around expectation. As such, the assumed probability distributions would need to be applied to adjusted best estimate assumptions, adjusted so as to include prudential margins. Further, the greater complexity of stochastic methods compared to a deterministic assumption with a margin for adverse deviation would not always be justified by the result.

8.4 A higher level of margin is appropriate for prudential supervision than for the market value margins incorporated in a fair value liability. The

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prudential margin would need to represent a high confidence level, having regard to recent experience, likely future trends, increased uncertainty for longer contract terms, and a reasonable level of adverse deviations. Credit should, though, be permitted for risk reducing factors, such as premium reviewability and reassurance.

8.5 The level of prudential margin would depend on whether relevant and reliable recent experience existed. A lower level of margin would be appropriate where reliable experience existed, together with a reasonable expectation that the future would follow past trends. A higher level of margin would be appropriate where there was no reliable recent experience, as would apply on the launch of a radically new contract, or where future trends were less certain.

8.6 The prudential margins, like the best estimate assumptions, would be set actively, potentially varying year by year. Where recent developments increased uncertainty (e.g. AIDS in the late 1980s, with increased uncertainty for future mortality, or the pending introduction of stakeholder pensions in the late 1990s, with increased uncertainty for withdrawals), prudential margins would increase. In time, the effects of such environmental changes would become more predictable, in which case the margins could be reduced.

8.7 Non-financial technical risks applicable to the insurance business in question need to be identified (see Appendix B5 for a categorisation of risks applicable to insurance business), and a prudential margin determined for each. The discussion below illustrates how the above considerations might apply to some of those risks:

— *Insurance risks (e.g. mortality/morbidity/property/casualty)*
  These risks include some where more risk-based capital should be required for uncertainty of best estimates rather than for stochastic variations. Some lines of general insurance business have inherently unpredictable claims, for which the notion of a reliable best estimate assumption, let alone parameters for distribution functions, may not exist. Where reliable best estimate and probability distribution assumptions can be derived, what was a prudent assumption would depend upon the nature of a contract. For example, use of recent mortality experience without allowance for increasing longevity might be thought to provide a reasonably prudential margin for assurances. For annuities, however, a more rigorous projection basis, with allowances for increasing longevity, would be expected. Other relevant aspects to be considered would include own experience, cyclical factors, claims control, and selection effects.
— *Lapse/surrender risk*
  An analysis of recent experience would provide a starting point for a best estimate future assumption. Risk-based capital might be calculated on the basis of adverse experience for each year in the future, and/or the potential for significant events that might cause future adverse step

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changes. Allowance might be made for expected interaction with investment conditions.

— *Expenses*
There has been some debate on whether a fair value liability should take credit for improved efficiencies, where the market view was that a particular entity was operating sub-optimally. In the context of a solvency standard, any assumed improvements would require robust justification, and, the Working Party felt, should generally not be anticipated until action to bring about the improvement had been implemented and been seen to have the intended effect.

— *Non-financial embedded options*
Allowance for non-financial embedded options might be based on investigations assessing the materiality of options, and, where material, on the variability of a fair value liability to changes in future experience.

8.8 Where there are several factors of future experience with prudential margins, an accumulation of margins could result in an overly stringent solvency requirement. Some allowance for the benefit of diversification resulting from a multitude of uncorrelated risks would seem to be justified.

8.9 A new solvency standard, built on top of fair value general purpose accounts, while not necessarily leading to lower capital requirements, would not necessarily satisfy all of the criteria contained in the current standards. For example, the fair value liability and a risk-based capital requirement together might:

— not cover current surrender values, unless further adjusted — see ¶8.9.1;
— make allowance for withdrawals that reduce capital requirements;
— be less than zero thereby treating contracts as an asset; or
— involve future valuation strain.

These and similar issues will need to be considered, to decide whether they are still relevant in the new world of fair value liabilities and risk-based capital requirements, and whether any specific adjustments are required.

8.9.1 The Working Party felt that, in general, the standard should provide a minimum of current surrender value on an individual policy basis, as it seems wrong for a contract, where a reserve/capital requirement in excess of the surrender value is needed, to allow that excess to be prejudiced by another policyholder's decision to surrender. This might be applied by requiring cover of the greater of the surrender value and the sum of the fair value liability and a pure risk-based capital requirement, thereby allowing credit for any excess of surrender value towards the pure risk-based capital requirement on a policy-by-policy basis. A possible exception would be the case of 'classic' with-profits business, where (part of) any accrued terminal bonus could be regarded as a policyholder contribution to the office's working capital.

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8.10 A new solvency standard, using a risk-based capital approach, as considered in Section 7 and in this section, for financial and non-financial technical risks, could also make allowance for other business risks, such as operational risk. Indeed, it might be thought that there should be a capital requirement in respect of operational risk, and that the issue was only at what level. The New Basel Capital Accord proposes introducing capital requirements in respect of operational risk for internationally active banks. In the consultative document of January 2001, the Basel Committee suggested 20% of minimum regulatory capital should be in respect of operational risk, although, since that date and in the light of comments received, it has accepted that this represents too large an allocation to the risk. Section 5 of this paper includes a summary of possible approaches proposed for operational risk in the New Basel Capital Accord. While the approaches are sufficiently general to form a framework for operational risk associated with insurance business, the different risks between banking and insurance business would almost certainly justify a different proportion of regulatory capital in respect of insurance business.

9. Particular Issues for U.K.-Style With-Profits

9.1 *Introduction*

9.1.1 This section of the paper is concerned with U.K.-style with-profits business, and the issues which arise in valuing benefits inextricably, but not necessarily directly, linked with the investment mix and performance of the backing assets. Rather than split the discussion between a section on general purpose reporting and one on prudential reporting, the authors felt that it would be more appropriate to have a single section, devoted to with-profits, dealing with both aspects.

9.1.2 There is not a unique meaning to the term 'with-profits', as currently applied in the U.K., as the October 2001 classification paper produced by the FSA demonstrates. Any valuation approach, for it to be valid, must make appropriate allowance for this diversity.

9.1.3 The diversity is not just to do with current benefits, guarantees and asset mixes, and how these might inter-relate in alternative investment conditions. Depending on what has been communicated, policyholder bonus expectations and how directors exercise any discretion open to them can differ between offices, and this raises the issue of how far such considerations should be reflected in reserving requirements.

9.1.4 The diversity can be seen, for example, in the variety of approaches to smoothing which are operated. It is possible that no two offices smooth using the same method or to the same extent. Offices may also reserve the right to change the extent of smoothing in certain circumstances.

9.1.5 How to make appropriate allowance for such features of with-

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profits business was one of the issues which the Fair Values Calculation Group encountered in their work. Adopting formulaic approaches to the quantification of PRE enabled calculations to be performed, but they recognised that this could be at the expense of appropriateness. Quoting, in Appendix C, from the report of the Faculty and Institute's Transparency of With-Profits Working Party, Clay *et al*. (2001), they note that: "the most fundamental feature of with-profits is that benefits are subject to discretion ... Full predetermination of benefits (either as amounts or through the application of an unchangeable set of rules) is incompatible with the with-profits concept."

9.1.6 It is not the first time that such issues have been recognised. For example, the issue of whether or not to reserve for accrued terminal bonus has been around for some time, and the former is now proposed in the FSA's draft Prudential Sourcebook (FSA, 2001a). Also, the Wright working party, Wright *et al*. (1998), proposed a reserving approach for unitised with-profits business, which required attention to be paid to what annual bonus rates could be reasonably expected.

9.1.7 Before discussing some of these issues further, it is worth considering the key distinguishing features of what constitutes 'with-profits' business today.

9.2 *What does 'With-Profits' Mean?*

9.2.1 In legalistic terms, a contract (or benefit within a contract) is 'with-profits' if the contract wording describes it as such, using either the phrase directly or in other words, such as: "right to participate in the distributable profits of the fund."

9.2.2 The manner of participation (and what the customer expects concerning it) is affected, not only by the formal contract wording, but also by how the benefit is described and sold in marketing literature, and, in an ongoing sense, by material accompanying bonus notices.

9.2.3 In considering the application of fair values to with-profits business, the Working Party considered a two-dimensional classification representing the diversity of approaches taken by different offices. On one axis was measured the degree of participation applying. On the other was measured the extent to which the benefits were subject to the discretion of the office concerned.

9.2.4 At one extreme corner of this mapping is what might be called the 'classic' approach, in which policyholders participate in all profits of the business (including those from non-profit business and any subsidiaries), and in which a high level of discretion applies, so that any 'rules' currently being followed by directors are subject to change, depending on business performance and the needs of ongoing solvency. Under this approach, with-profits policyholders effectively act as suppliers of equity, and are treated as such.

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9.2.5 Diagonally opposite in the classification diagram is what might be termed 'smoothed unit-linked', in which participation in profits relates mostly, if not entirely, to the investment performance underlying asset shares, and the office has little discretion over benefit amounts. Under this approach, others are seen to supply the necessary equity, and there is a strong *a priori* expectation (or at least aspiration) that current 'rules' regarding smoothing, etc. will be maintained. This leads to a style of 'near-guarantee', at least as far as how benefits will be calculated and bonus levels determined.

9.2.6 Within the square defined by these 'corners' lie all of the with-profits funds of today. Where each lies depends on the extent of participation and discretion, and not what might be called the 'form of delivery' of the benefits. For example, a unitised approach to with-profits need not lie close to what has been referred to above as 'smoothed unit-linked.' Similarly the 'classic' approach need not be limited to 'conventional' or 'traditional' policy designs. While the smoothed unit-linked approach is probably the vision which inspires much of the current customer protection thinking, what is referred to above as the classic approach can still be found in the marketplace.

9.3 *IASB Proposals for General Purpose Reporting*

9.3.1 In its consideration of with-profits (or 'participating' as it was referred to) business, the IASB Issues Paper recognised the possibility of policyholders supplying equity to the business, particularly in connection with what should be shown as equity on the balance sheet.

9.3.2 The term 'unallocated divisible surplus' was used to refer to the "cumulative amount that is available for allocation to current or future policyholders (and, where applicable, stockholders), but remains unallocated." The Steering Committee proposed that, where the office had a legal or constructive obligation to allocate part of this cumulative amount to current or future policyholders, that part of the unallocated divisible surplus should be treated as a liability.

9.3.3 An implication of this proposal is that terminal bonus would be treated as a liability for general purpose reporting purposes by offices transacting U.K.-style with-profits business, wherever on the two-dimensional classification, described in Section 9.2, the particular approach to with-profits lay.

9.3.4 To the extent that no such obligation existed, or that it did exist, but could not be measured reliably, the Steering Committee proposed that such unallocated divisible surplus should be treated as equity. This could mean that, for a proprietary office, all orphan surplus would be shown as equity on a balance sheet, irrespective of whether the fund concerned was '90/10' or '100/0', etc. and whether any attribution, though not allocation, basis for that orphan surplus between policyholders and shareholders had

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been agreed with the regulator. Of course, where it was intended to supplement policy payouts with a distribution from (policyholder-attributed) orphan surplus, an appropriate liability would have to be set up. In the case of mutuals, a similar situation would exist — where any distribution of inherited estate was intended, this would be included as a liability; the balance of any inherited estate would be shown as equity.

9.3.5 Thus, the Issues Paper saw with-profits liabilities as, in effect, asset shares plus whatever else the office had an obligation to allocate. Such an approach raises several issues as far as U.K.-style with-profits business is concerned.

9.3.5.1 It would not necessarily give an appropriate picture of an office transacting the 'classic' variety of with-profits business, unless that part of the liability which was 'current policyholder-supplied equity' was separately identified.

9.3.5.2 It would also be helpful if that part of the office's equity which was attributed (but not allocated) to policyholders were to be shown separately from any equity within policyholder asset shares, a point picked up by the IAA in their response to the IASB's proposals.

9.3.5.3 The extent to which it took into account PRE issues of smoothing and/or bonus progression would depend on how much of any reserve (in excess of asset shares) held for this purpose was considered to fall under the principle in ¶9.3.2 rather than in ¶9.3.4. Interesting issues regarding the preservation of PRE could arise if the prudential reserve for this purpose were to be significantly greater than the general purpose reporting provision (since the latter is intended to be the market value of the liability).

9.3.5.4 In order that it would represent market prices for the exchange of such a portfolio, allowance would need to be made for any expected profits to the life office from, say, charges to asset shares or future premiums. (Of course, allowance would not be required in respect of charges made at 'cost' for, say, mortality or 'expected cost' for, say, smoothing, since such charges are to do with re-distributing monies between policyholders rather than generating profits for the life office.)

9.3.6 Thus, some modifications are needed to the Steering Committee's proposals in order to fit the U.K. context.

9.4 *Possible Approaches for General Purpose Reporting*

9.4.1 As explained in Appendix C, the Fair Values Calculation Group attempted to calculate general purpose reporting reserves for with-profits business through stochastic modelling, with deflators being used to obtain market-consistent present values (see Appendix B6 for a brief introduction to deflators).

9.4.1.1 While such an approach derives present values from future cash flows in a manner which is independent of the backing assets, an assumption

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regarding backing assets is still required in order to arrive at the benefits (i.e. future bonuses) to value.

9.4.1.2 The original proposals in the IASB Issues Paper included the intention that the fair value of a liability should be independent of the assets held to back it. While this may be practicable for some liabilities, responses to the IASB were quick to point out that this was not possible in all cases. The IASB accepted the point in their initial response to the comments received. It could be argued that, as a compromise, some 'market average' asset mix could be used for the generation of the future cash flows to be deflated. However, while this would certainly enable a liability value to be calculated, its relevance, particularly in terms of PRE, would have to be questioned.

9.4.1.3 The PRE of the particular portfolio of policies being valued has implications for more than just the backing asset mix. Current actuarial understanding of PRE suggests that it extends to the level of bonus rates declared, and the extent to which payments to policyholders are smoothed.

9.4.1.4 The assumptions made concerning future practice, and the interaction with the asset mix modelled, can have a significant influence on the size of the liabilities calculated. While such formulaic approaches may be appropriate for some variations of with-profits, other more flexible approaches may be more suitable for other types.

9.4.1.5 Were stochastically generated reserves to be adopted for general purpose reporting, guidance (and subsequent supervision) would be required to ensure that the extent of office's discretion over future actions was appropriately covered. The proposed Actuarial Standards Board could have a role in this.

9.4.2 An alternative approach to general purpose reporting would be to start with what might be termed the 'PRE surrender value', the proportion of the (smoothed) asset share which is targeted on claim, less any immediate surrender deductions. This basic liability would then be subject to a number of adjustments.

9.4.2.1 Where asset shares were calculated on the basis of charges rather than on actual experience, sterling reserves (positive or negative) may be required to cover any anticipated differences in the profile of expenses and charges.

9.4.2.2 Where actual claim values differed in the short term from asset shares less surrender deductions, an appropriate allowance would need to be made for the profits or losses expected as a consequence.

9.4.2.3 Appropriate allowance (i.e. the market value) would also be required for any options or guarantees which applied to the policies in question. This (estimated) market value would need to be consistent with derivative pricing at the balance sheet date. It would also need to reflect any relevant aspects of the underlying investment mix of the asset shares.

9.4.2.4 To what extent stochastic modelling would be required to

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calculate these adjustments would need to be investigated. It may be that suitable deterministic approximations could be sufficient, after appropriate calibration experiments had been carried out, based on the market conditions at the time.

9.4.3 It should be noted that both approaches are likely to lead to larger balance sheet reserves than under current U.K. general purpose reporting. One reason for this is that, in effect, the approaches cause part of the Fund for Future Appropriations to be shown as policy liabilities.

9.4.4 Finally, as presented, they both are liable to the criticism that they do not specifically identify the extent of policyholder equity under the classic approach to with-profits. While this could be addressed under the first approach by using the stochastic model to value only the current guarantees, it may be more appropriate to address this issue as part of the derivation of RBC for prudential reporting.

9.5 *Prudential Solvency Reporting for With-Profits Business*

9.5.1 In keeping with the proposals for the prudential solvency reporting of other lines of business, the Working Party proposes that a similar risk-based capital approach be followed for with-profits liabilities.

9.5.2 However, for certain forms of with-profits business at least, a major adjustment may be appropriate.

9.5.2.1 Under what is referred to above as the 'classic' form of with-profits, with-profits policyholders, depending on a proper interpretation of PRE, share, to a substantial extent, in the risks of the business. Indeed, for a mutual business they may collectively (over time) bear *all* the risks of the business — the natural and equitable counterpart to their right to share in the profits is the duty of sharing in the losses. The mechanism for sharing in the profits and losses is management policy in relation to the setting of terminal bonus rates and future reversionary bonus rates and, possibly also, where management discretion exists, in the determination of surrender values and the variation in insurance risk and expense charges. So, although a substantial part of policyholders' (prospective) benefits could be guaranteed (either in absolute or unit-linked form), especially early in a policy's life, a substantial part (e.g. the terminal bonus content) is not guaranteed, and is in the nature of a provision of equity to the company.

9.5.2.2 This capacity of the classic form of with-profits to contribute to risk-bearing has important consequences for determining RBC in a context of fair value-based general purpose reporting. The objective of general purpose reporting is to display the progress of the company, and that objective demands that all prospective benefits to policyholders be treated as a liability, even when parts of the prospective benefits have equity characteristics. However, when it comes to showing how the company stands in terms of its capacity to carry risks, that part of the fair value liability for 'classic' with-profits that corresponds to its risk-bearing capacity should

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properly be treated as a credit against RBC requirements. Effectively, classic with-profits is capable of generating negative RBC (although, as noted in ¶9.5.2.4, the extent to which this might occur in practice is closely related to the investment mix of the backing assets).

9.5.2.3 It may be noted that the historic approach to valuing with-profits business has achieved the same effect through another route, at least in the U.K. Liabilities for the classic form of with-profits have, in the main, related to valuing basic sums assured/annuities plus declared bonuses, with no liability being calculated in relation to terminal bonus, except to the extent that the use of a valuation interest rate based on equity dividend yields makes implicit allowance for terminal bonus, in addition to allowing for equity volatility.

9.5.2.4 Two important caveats need to be made. The first is that company managements will generally seek to make use of the capacity to bear risk, to the extent that the business allows. In particular, management may increase or reduce the equity backing ratio, so as to absorb the risk-bearing capacity so generated by the business, or may write other lines of business (e.g. non-profit), profits from which will be available to enhance bonus rates. The aggregate effect may thus be to offset, in part or even wholly, the credit against RBC that would otherwise be generated. Adjustment to the equity backing ratio is, of course, one of the most important tools management has for managing with-profits business.

9.5.2.5 The second caveat is of particular current significance. It relates to the need for a company to satisfy itself that the freedoms which have, to the best knowledge of managements, been available to them to manage with-profits business (particularly in the classic mode), and signalled, to a substantial extent, in product literature and other communications, are indeed available to them in law. A recent judgment has cast doubt on this.

9.5.2.6 Depending on the outcome of a company's investigations into the latter caveat, a company may decide that, after all, even what it thought of as a with-profits portfolio of the classic style was, in fact, likely to prove to lie more towards the opposite corner of the distribution referred to in Section 9.2. (Even if the company felt reasonably satisfied as to its classic status, it may need to consider whether a substantial item of RBC should be held against the business risk that a legal judgment might go against it. The Working Party is sure that this last consideration would prove to be highly contentious for a company. If, after taking best advice, you decide that your legal position is A, where do you stop in thinking of possible B, C, D, etc. outcomes, against which you might, perhaps, want to hold capital?!)

9.5.3 Such considerations aside, there are several approaches which could be used to arrive at the amount of RBC to hold in respect of a portfolio of with-profits business, irrespective of where in the classification the approach to with-profits lay.

9.5.3.1 One approach would be to follow the approach described in

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Section 6.4. The starting point would be the general purpose reporting liabilities, and these would be increased (or decreased), through an iterative process, until the number of instances of ruin was reduced to a pre-determined maximum.

9.5.3.2 An alternative approach would follow on from the approach to calculating general purpose reporting reserves, described in ¶9.4.1. In this case, the stochastic projections would be repeated, but with more prudent assumptions used for the non-investment variables (e.g. expenses, lapses, mortality). The resulting projections would again be deflated to the present. It could be argued that the resulting liability would need to have one further margin added, to reflect the fact that the office may not be following the dynamic hedging strategy for the assets which underlies deflator theory.

9.5.3.3 It should be noted, though, that both these methods would again, in effect, reserve for terminal bonus, and lock in the consequences of whatever bonus formulae had been used. Depending on the equity backing ratio of the backing assets, the resulting reserves could be considerably in excess of current values. The ensuing communication and education challenges should not be underestimated!

9.5.3.4 Alternative approaches could be investigated, in which lower levels of PRE in addition to current attaching bonuses were reserved for. The Working Party recommends that further work be done to investigate what principles could be laid down by regulators, which would reflect the diverse nature of with-profits business, while still making proper provision for offices' continued solvency.

9.5.4 One final point worth making relates to the backing asset mix which should be used for the RBC calculations. The starting point should be the actual investment strategy being followed at the reporting date. However, where this was materially different from the long-term strategic intention (e.g. temporarily more in fixed-interest for investment reasons), an additional PRE reserve should be held within the RBC to reflect future intentions.

10. The Role of the Actuary and the Actuarial Profession in Fair Value Reporting

10.1 The determination of fair values of insurance contracts will require the application of sophisticated mathematical, statistical and modelling techniques. The IAA, in its response to the Issues Paper, pointed out that, through its education and training, its traditional involvement and expertise in the analysis of risks associated with insurance obligations and its stature as a profession used to working to high standards within standards of practice backed up by a code of conduct and disciplinary procedure, the actuarial profession is in a strong position to assume the responsibilities that the

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valuation task will entail. The Working Party supports this position. The IAA acknowledged that the required attributes are not necessarily unique to actuaries, and that other individuals who possessed the requisite qualities might also have a role, and the Working Party does not demur from this.

10.2 The exercise of judgement and estimation is inescapable. This will, as pointed out elsewhere (see ¶4.6), provide a challenge to full comparability of the final results. The Working Party has proposed, for consideration (Appendix B1), the establishment of an Actuarial Standards Board, which could result in enhanced comparability of results (perfect comparability is almost certainly an unattainable ideal). To succeed, the Working Party considers that such a Board would need, as well as having a strong actuarial presence on, and supporting, the Board, to liaise closely with the profession and with actuaries working in companies and other reporting entities.

10.3 It is self-evident that the involvement of actuaries will need to have full regard to the role of auditors. There are good examples, from a number of areas of the world, of formal processes having been established to ensure fruitful working between the two professions. The Working Party is confident that similar arrangements can be established for fair value-based reporting, whether for general purpose or prudential reporting.

10.4 The Working Party notes that the IAA intends to develop professional standards of practice for actuaries to be applied under the IASB's standards for valuation of insurance contracts, and to work constructively with the IASB to help ensure that the standards are appropriate. The U.K. profession is well placed to contribute to this process.

11. Summary Remarks and Further Work

11.1 *Summary Remarks*

11.1.1 With regard to general purpose reporting, the Working Party regards a move to an international accounting standard for insurance on a fair value basis (or an entity-specific equivalent), in conjunction with a similar move for financial instruments, as a very desirable development. With respect to the value placed upon quoted instruments, the Working Party considers the use of fair values to be uncontentious. With regard to unquoted instruments, which would include virtually all technical liabilities of insurance companies, the concept of fair (meaning market) value seems philosophically somewhat elusive. However, at least in the short/medium term, the bulk of the advantages sought for this development can be obtained using entity-specific valuations, subject to such measures as can be put in place to promote consistency between valuation assumptions and market conditions.

11.1.2 The Working Party has noted trends, already evident in thinking among prudential regulators and others, in favour of a move to a fuller implementation of a risk-based capital approach to determining and

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displaying prudential financial requirements. The Working Party supports such an approach.

11.1.3 To be satisfactory, a risk-based capital system should satisfy principles of adequacy, transparency, level playing field, support of good risk management practice, allowing for actual asset backing and policyholder options, and should be designed to allow a progressive and proportionate response where coverage of prudential requirements is weakening. This can be done within a fair value-based general purpose reporting framework.

11.1.4 There seem to be two broad approaches to the calculation of risk-based capital. Building blocks approaches have the advantages of simplicity, but can allow only crudely for a company's true risk situation. Probabilistic approaches are considerably more complex, but, although there are limits on the ability of any underlying probabilistic model to replicate the real world, such approaches can more fully respond to, and allow for, a company's actual risk exposure.

11.2 *Further Work*

11.2.1 The Working Party is conscious that, in presenting its findings to date, there is still a significant number of items for further work that the profession might have hoped that we would have addressed already. We look forward to suggestions from members of the profession and others as to other items for attention, and will be happy to hear of other opinions on matters of principle on which we have ventured our own view.

11.2.2 Further work includes:

(1) ongoing liaison with the IASB and other bodies on the emerging International Accounting Standard;
(2) consideration of how fair value-based reporting will be structured, including, in particular, how significant developments and trends can be sifted out from the 'noise' created by market value fluctuations;
(3) developing the structure for disclosure of assumptions and modelling (whether stochastic or otherwise) in a way that is meaningful, accessible to a wide audience and capable of allowing comparisons between different reporting entities;
(4) further investigation into the range of methods, models and stochastic engines available, with associated tools such as deflators, and the practical problems of using them and calibrating them to market within normal reporting timescales;
(5) investigations into withdrawal experience, its volatility within, and between, companies, and correlation with economic and other factors; and similar investigations in relation to expenses;
(6) further investigation into sensitivities of fair value-based profits and of risk-based capital requirements to assumptions, including the likely/possible variants within what would be considered an acceptable range of professional judgements on such assumptions;

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(7) investigation into the various issues surrounding risk (or expected cost) of ruin, including definition of ruin, term over which it is measured, choice/authorisation of stochastic model(s), etc. — see Section 6.6;
(8) obtaining discussion and feedback from the profession on the suggestion of an Actuarial Standards Board;
(9) development of appropriate professional guidance, in liaison with the IAA;
(10) identification of the likely costs of applying fair value and risk-based capital methodologies and consideration of the impact thereof in relation to the benefits;
(11) consideration of transitional issues during conversion from existing reporting methods, both as to strains on costs/resources and on the need to educate users of financial statements on how to interpret the results; and
(12) consideration of the implications for tax computations and, for some with-profits companies, for profit distribution between policyholders and shareholders.

11.2.3 A number of members of the Working Party would be willing to serve on any successor Working Party, where the emphasis will, we believe, be more fully directed at issues of practical implementation. Any members of the profession who would also like to be part of this further work are invited to contact the Life Board.

12. Acknowledgments

The demands of the Working Party's brief have been considerable, and along the way two early members, Chris Headdon and Keith Miller, felt obliged by other demands to withdraw. We have also had two observers, Malcolm Dann (FSA, previously GAD) and Nigel Masters (Accounting Issues Committee of the Life Board of the Faculty and Institute) with Nigel being supported by Steve Mills as alternate on the Working Party. Also, Tim Sheldon and Paul Coulthard attended one of our meetings to brief us on deflators. We thank all of these for their much valued contributions to our deliberations, and in the case of Steve, who also served on the Fair Values Calculation Group, for his contribution to some of the drafting of the paper.

The Working Party is most grateful to the Fair Values Calculation Group, under the chairmanship of Richard Priestley. Acting under terms of reference agreed jointly by the Accounting Issues Committee of the Life Board of the U.K. profession and ourselves, they have carried out a number of valuable numerical explorations of fair value accounting. They have prepared a note

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(for which they take responsibility) summarising some of their findings, which is attached as Appendix C, and they intend, in due course, to publish a paper describing their work and results in further detail.

Notwithstanding all this support and, indeed, the wisdom of fellow actuaries and others, past and future, including those whose work is cited in the bibliography, and apart from Appendix C, the Working Party takes full responsibility for the paper.

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Finally, there are numerous further papers internationally. One source will be the proceedings of the Bowles Symposium in Atlanta (2001), to be published in *North American Actuarial Journal*, together with cross-references from those papers. Websites of actuarial and accountancy bodies will also be a source.

WEBSITES

www.actuaries.asn.au Institute of Actuaries of Australia
www.actuaries.ca Canadian Institute of Actuaries
www.actuaries.org International Actuarial Association
www.actuaries.org.uk Faculty and Institute of Actuaries
www.actuary.org American Academy of Actuaries
www.actuary.org/asb.htm U.S. Actuarial Standards Board
www.apra.gov.au/iands/life/actuarial.htm Australian Actuarial Standards Board
www.bis.org Bank for International Settlements
www.casact.org Casualty Actuarial Society
www.fsa.gov.uk Financial Services Authority
www.iaisweb.org International Association of Insurance Supervisors
www.IASB.org.uk International Accounting Standards Board. For current status of Insurance Project, follow the links: Standards>Current IASB Projects>Insurance Contracts
www.soa.org Society of Actuaries

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APPENDIX A

TERMS OF REFERENCE AND MEMBERSHIP

The Working Party was established at the request of the Life Board of the Institute and the Faculty of Actuaries in 1999. After some discussion between the Board and the Working Party, the following terms of reference were agreed:

"It is recognised that the existing methods of actuarial valuation for long-term insurance, particularly for supervisory purposes, are inadequate for their purpose under certain circumstances and economic conditions. It is therefore proposed that a working party be asked to reconsider the issues. The intention is that they be given an extremely wide set of terms of reference in order to consider the problem from a professional and theoretical perspective unhampered by the requirements and constraints currently imposed by legislation in the U.K., the E.U. or elsewhere.

The Working Party will report directly to the Life Board.

1. The Working Party should consider the various objectives of valuation e.g. solvency supervision, valuation for policyholders' reasonable expectations, valuation for resilience, including using a risk capital approach, and valuation for presentation in annual Companies Act accounts (generally, in U.K., of parent companies, distinguishing, if necessary, between whether the principal business of the parent is insurance business or not). It should review the essential characteristics of each and consider whether it is possible to produce consistency from approach to approach.
2. The Working Party is asked to consider whether better methods could be developed if the constraints of existing regulation and legislation were to be ignored. In particular it is to be assumed that a new International Accounting Standard will be developed and that fair value of both assets and liabilities will be incorporated in annual reporting.
3. The Working Party should attempt to identify a set of valuation principles for supervision and associated purposes. Without unduly limiting itself to U.K.-based considerations, the Working Party should have regard to the situation for (U.K.-style) with-profits business.
4. In its deliberations the Working Party needs to take into account all types of long-term products, unitised and conventional, existing and developing, with and without profits.

As part of its deliberations the Working Party should consider the existing material and material being produced on the subject within and outside the profession, in the U.K. and overseas, including but not limited to material

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being produced in conjunction with work by or on behalf of the International Accounting Standards Committee. It should consult widely within the profession, including views from regulators.''

The membership of the Working Party was as follows:

Chris Hairs (Chairman)	David Hare
David Belsham	David Smith
Norval Bryson	Stuart Thompson
Chris George	

The following attended as observers:

Malcolm Dann	Nigel Masters, with Steve Mills as occasional alternate

The following were members during the early part of the Working Party's life:

Chris Headdon	Keith Miller

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APPENDIX B1

ACTUARIAL STANDARDS BOARD

B1.1 *The Problem*

B1.1.1 Application of fair value-based accounting is (in principle) straightforward, where credible market values exist for the assets or liabilities concerned. In particular, the objective standard represented by the market price as at an accounting date is a major factor in ensuring that accounts are comparable and on a consistent basis as between all entities reporting on that date.

B1.1.2 However, although, normally, most of the assets of an insurance business, at least in the United Kingdom, North America, Australia and most of Europe, can be measured in relation to an objective market value, virtually all of the liabilities (and perhaps some of the assets) cannot be so measured, either because a market price does not exist, or because such prices as do exist relate only to special circumstances, such as takeovers.

B1.1.3 For these liabilities (and assets), determination of fair values will be made by the application of actuarial techniques to data representing the insurance business of the reporting entity, using assumptions that correspond to the company's projected experience, where both the techniques and assumptions are to be calibrated, where possible, and relevant to market-derived parameters.

B1.1.4 Considerable concern was expressed to the IASB during consultations following the Issues Paper, that variations in actuarial (and other) judgement will inevitably lead to comparability of the results being compromised. Even when such variation does not occur in fact, it may be impossible to demonstrate this, with the result that confidence in comparability is undermined.

B1.2 *Working Party View*

B1.2.1 The Working Party accepts that these dangers have to be addressed. In the first instance this should be done by a searching examination of the Standard, including accompanying statements of recommended practice and other guidelines, when it emerges. It may be that such examination, which should include suitable and extensive consultation with actuaries, accountants and others likely to be involved in calculating, auditing and using fair values and the corresponding accounts, will result in the conclusion that comparability is, in fact, protected, within reasonable bounds of materiality, and can be demonstrated to be so.

B1.2.2 It may, however, be that the provisions of the Standard and accompanying guidelines, which are likely to be couched in general terms only, and which will not constantly be updated, will not, by themselves, be

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sufficient to secure comparability. The mechanism that the Working Party proposes for consideration, to supplement the Standard/guidelines, is a permanent body charged with producing and publishing ongoing guidance as to methods and parameters to be followed by fair value calculators. Since the prime recipients of the requirements of such a body will be actuaries, we refer to this body here as an Actuarial Standards Board (ASB (FV)).

B1.3 *Actuarial Standards Boards — Existing Examples*

The Working Party is aware of two examples of Actuarial Standards Boards currently in existence, in Australia and in the United States of America. In many other territories, indeed probably in all in which there is an established insurance industry, there are bodies which, to a greater or lesser extent, lay down standards. These bodies are generally either the local supervisory authorities, or the local actuarial association, or some partnership between the two. We outline here the essential features of the ASBs in Australia and the U.S.A.

B1.3.1 *Australia*

The Australian ASB, the Life Insurance Actuarial Standards Board (LIASB), is a statutory body established in Australia under its Life Insurance Act 1995 (the Act). The structure and function of the LIASB are defined in that Act and are summarised below. The aim of the LIASB is to make actuarial standards for the purposes of the Act.

The Act prescribes the matters for which actuarial standards may be made. These matters include the valuation of policy liabilities and the capital requirements for the company, as well as certain aspects of product design.

An actuarial standard is a legislative instrument, and a disallowable instrument. That is that it carries the power of Commonwealth law, and must pass through the legislative processes of Parliament in order to be made.

Included in these processes are appropriate requirements for consultation and exposure in the development of actuarial standards.

Members are appointed to the LIASB by the Treasurer. Membership is defined as a maximum of seven members, all but one of the members are to be members of the Institute of Actuaries of Australia (IAAust) with relevant qualifications/experience in relation to life insurance. One member will be the government member.

Details in relation to conduct of meetings, establishment of quorum and making of resolutions are set out in the Act. The LIASB must produce an annual report.

The Life Act, and hence the actuarial standards made under that Act, are administered by the Australian Prudential Regulation Authority. The standards are legally binding on companies, and hence on life company actuaries. The Act establishes the requirement for an Appointed Actuary of life companies.

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The LIASB is independent of the IAAust. However, in developing actuarial standards, the LIASB works closely with the IAAust. The IAAust develops guidance material/practice notes for its members under its own constitution and due process, to supplement the actuarial standards produced by the LIASB.

It is noted that the LIASB model exists only in the life insurance industry in Australia.

B1.3.2 *United States of America*

The ASB in the U.S.A. was established on 1 July 1988, under the auspices of the American Academy of Actuaries (AAA). Although it operates with the support of the AAA staff, it is an independent entity.

The U.S. ASB is charged with the following: (1) to direct and manage the development of actuarial standards of practice by its operating committees in all areas of actuarial practice; (2) to expose, promulgate or adopt, and publish actuarial standards of practice, within its sole discretion and pursuant to such procedures as it deems appropriate, in all areas of actuarial practice; and (3) to provide continuous review of existing standards of practice and determine whether they are in need of amendment, alteration, expansion, or elimination. Its standards of practice are for actuaries practising in the U.S.A., and the complete set of Actuarial Standards of Practice (ASOPs), the Code of Professional Conduct and the Board's procedure manual are held within its handbook.

The requirements produced by the ASB are mandatory on the U.S. actuarial profession, being enforced by the Code of Professional Conduct, backed up by the disciplinary procedures of the Academy.

The ASB works through operating committees, concerned with Casualty, Health, Life, Pensions, Retiree Health Care and Specialty Business respectively, and a General Committee, together with a number of sub-committees and task forces.

As at February 2000, the U.S. ASB has promulgated 40 ASOPs, covering a wide range of actuarial tasks and four actuarial compliance guidelines, and a number of exposure drafts for either new ASOPs or revisions to existing ASOPs are in course of being considered.

The Working Party has reviewed several of the U.S. ASB's ASOPs. It has noted that they typically represent guidance to a fair level of detail, comparable to that of the more prescriptive of those of the Faculty and Institute. The ASB does not attempt, though, to lay down specific valuation factors as at current dates. Nor does it authorise stochastic generators or valuation models.

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B1.4 *Possible Model for an ASB (FV) to Control Comparability of Fair Value Reporting*

B1.4.1 *Tasks*

— To monitor and analyse continuously movements in market values of assets and in the prices at which liabilities are exchanged.
— To provide continuous and timely guidance as to assumptions and parameters, consistent with its conclusions from its monitoring of market values, to be employed by insurance companies reporting under Fair Value Accounting Standards.
— To examine and authorise, or withhold authorisation from, actuarial and other models, stochastic generators, claim run-off patterns, etc.
— At all times, the ASB(FV)'s guidance should comply with the corresponding Accounting Standard.
— To liaise with the IAA over statements of practice.

B1.4.2 *Constitution*

— The ASB(FV) should be organised under the auspices of the national actuarial profession, but be independent of it, being answerable to the relevant national accounting standards authority.

B1.4.3 *Authority*

— The rulings and guidance of the ASB(FV) should be mandatory on all reporting entities, except that the entity may, if it considers the rulings/guidance to be inapplicable to its situation in a material way, consult with the ASB(FV) and then apply such amended valuation process(es) as it thinks fit, subject to clear and full disclosure, including, if possible, the ASB(FV)'s endorsement of its amended approach.

B1.5 *Pros and Cons*

B1.5.1 The key 'pro', if such an ASB(FV) can be made to work, would be the securing of consistency between reporting entities under a fair value regime so as to achieve comparability, within materiality limits. Other pros may arise, insofar as an ASB(FV) would facilitate a fast track approach to achievement of standardised tools and methods, thereby considerably reducing what otherwise promises to be a materially burdensome task for smaller companies of producing fair values for their insurance business.

B1.5.2 The 'cons' are not few however:

— Information on a company, which is the basis on which assumptions are set, does not come in standard form. There is clear danger of rules, being developed for universal application, which prove inappropriate for particular companies.
— Because the rules will be of universal application, they will have to be extremely extensive, and hence difficult both for the users and for the ASB(FV) to maintain.

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— There will be rules which will be applicable to all aspects of a business, even when, for particular companies, some aspects will be immaterial. However, there will be pressure to apply them anyway, thereby undermining the benefit of materiality considerations.
— There are clear dangers of bureaucracy in the operation of such a Board. For example:
  — Development of new/improved modelling and other methods may be handicapped by having to get them approved by an ASB(FV) before use.
  — Development of new products may be slowed, if, before introduction, the ASB(FV) has to develop valuation rules/parameters for them.

— De-skilling the FV calculation may lead to loss of talented actuaries to the industry.
— The ASB(FV) will doubtless be an expensive body to run, representing an overhead for the industry.
— There will need to be tight links between different ASB(FV)s in different countries if consistency on an international basis is to be achieved.
— More fundamentally, can one be sure that the remit of an ASB(FV) is achievable in practice? The complexity of the task and the massive pressure to produce parameters instantly would be most formidable. And if/when mistakes are made in the guidance, possibly resulting in losses to companies, who pays? (But then who said that it was going to be easy!)

It is the belief of the Working Party that the most important thing about most of the objections is to recognise them in advance, so that they can be minimised, if not eliminated. In the spirit of such considerations, the Working Party will welcome the logging of any further suggested objections. Any additional comments in favour would also be appreciated.

B1.6 The Working Party proposes that the concept of an ASB (FV) be considered and debated, both within and without the profession. Notwithstanding the cons, the Working Party considers that the idea has merit.

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APPENDIX B2

ENTITY-SPECIFIC VALUES

B2.1 *Introduction*

The basic definition of 'fair value' is as follows:

"Fair value is 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 to a third party at the balance sheet date to take over the liability."

The application of fair value to asset values is relatively clear — an asset should generally be capable of being sold. The application to liabilities is less clear-cut, particularly for insurance liabilities, where the market for such liabilities may be limited or non-existent. Possibilities identified in submissions to the IASB are as follows:

— fair value as an asset (the amount at which others are willing to hold the liability as an asset);
— fair value in settlement with the creditor/policyholder (the amount that the enterprise would have to pay to the creditor/policyholder to extinguish the liability); and
— fair value in exchange (the amount that the enterprise would have to pay a third party at the balance sheet to take over the liability).

The second of these possibilities leads directly to an entity-specific definition of value as follows:

"Entity-specific value represents the value 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 in an orderly fashion over the life of the liability."

B2.2 *Difference between Fair Value and Entity Specific Value*

The key difference between the two approaches is that an entity specific value envisages an insurance company holding the asset or liability and valuing the cash flows that arise from it, whereas a fair value approach is based on a (hypothetical) transaction with another entity. Other differences flow from this starting point.

An insurer may have management skills and/or practices at a level different from that available in the market generally. An entity-specific value

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would reflect the company specific level in valuing assets or liabilities, whereas fair value would use the market level. An example could be reserves for compensation payments. To protect its brand and reputation, an insurance company may have a practice of meeting compensation claims more readily or at greater cost than is strictly necessary, and hence an entity specific reserve liability would exceed the equivalent fair value liability.

The management of the insurance company may take a different view to that held by the market generally, on both the appropriate allowance for risk and the pricing of that risk. Entity-specific valuations would use the management's views as a starting point, whereas fair value should reflect the market view. An example could be the allowance for future mortality improvement.

In the latest IASB discussions, it is proposed that the entity-specific value of a liability would not reflect the insurance company's credit standing. The fair value approach has the potential for making allowance for an entity's own credit standing, although this remains an open question. A more complete discussion of credit standing is given in Appendix B3.

B2.3 *Commentary*

Whilst it may appear that the differences between fair value and entity specific value are significant, these differences may not be so material in practice. For example, when assessing an appropriate mortality assumption, the entity may have inadequate experience, in which case it would be forced to use a market-based assumption, perhaps derived from non-profit premium rates. On the other hand, if adequate experience does exist, it is clear from the reassurance market that this experience would be used in pricing the mortality risk for the insurance company concerned. The starting point for assessing an appropriate mortality assumption would, therefore, be the same under both approaches. As noted in Section B2.2, however, there would still be room for differences between the insurance company management and the market over allowances in areas such as the rate of future improvement.

An entity-specific and fair value approach to expenses is also instructive. Where an insurance company chooses to provide superior service levels at greater cost than the market, this will be reflected in the entity-specific value of the insurance company. However, it would also be reflected in the fair value expense assumptions, as these should recognise the need to purchase a level of service above that normally provided in the market. Where the two approaches could differ is in the level of efficiency. Entity-specific assumptions will reflect the insurance company's own efficiency, whereas fair value assumptions would tend to reflect the market level of efficiency, notably that provided by third party providers.

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B2.4 *Working Party Views*

The Working Party takes the view that an entity-specific approach to valuation is acceptable. Indeed, as most insurance liabilities are not traded, market expectations are not generally observable, and hence assumptions necessarily need to reflect the insurer's own expectations. An entity-specific approach provides a practical alternative to a full fair value approach. However, where a market assessment is available, particularly in judgemental areas, such as an appropriate allowance or price for risk, the Working Party feels that this should be used as a benchmark, and in preference to the insurance company management's view.

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APPENDIX B3

CREDIT STANDING

B3.1 *Introduction*

The market value of corporate debt takes account of the credit standing of the entity issuing that debt. If we assume that corporate debt is tradable, quoted and liquid, then any form of fair value measurement of that debt as an asset is likely to equate fair value to market value.

If an insurer reporting on a fair value basis takes account of the credit standing of other corporate entities in the reporting of the fair value of assets held, should it also take account of its own credit standing in reporting the value of its own corporate debt? Further, should it make allowance for its own credit standing in reporting the value of its insurance liabilities generally?

Allowance for credit standing in fair value accounting is an issue that is yet to be fully resolved. A number of observers argue that to fail to take account of credit standing is contrary to the economic principles underlying the fair value approach. Other observers simply do not accept the concept that an insurer's liabilities reduce in value as its credit standing falls. In the latest approach to entity-specific values, it is proposed that the entity's credit standing does not form part of the assessment of its liabilities — an approach that is potentially materially different from the adoption of other versions of fair value.

B3.2 *Example 1*

A couple of examples help to bring out the issues under consideration. Consider first an insurance company that has 100 of corporate debt paying the market rate of interest for highly rated companies of, say, 7%. Further assume that the insurance company's actual credit standing is poor, such that the market value and market yield of the debt are 80 and 11% respectively. Two approaches to recording the value of this debt in the insurance company's own accounts are possible.

First, the debt could be recorded at its nominal value of 100. If the company remains as a going concern, this is the value that will be paid out to settle the debt. However, should another insurance company hold this corporate debt as an asset, it would only value it at 80. Can it be 'fair value' to show the same debt at two such different values in two sets of accounts?

The second approach would value the debt at 80 to ensure compatibility with the value placed on the debt as an asset by a third party. This would appear to be acceptable, particularly if the insurance company had an ability to repurchase its own debt in the market. However, there are wider issues to consider, for example comparability of accounts is a key aim of any

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accounting standard. To make a proper comparison of the accounts for this insurance company, with a corporate debt shown at a value of 80, with another, more highly rated, insurance company, that also had corporate debt of 80, it would be essential to know that the first company was required to pay 11% on its debt whereas the other company only needed to pay 7%. Further, the repurchase argument only applies if the insurance company has sufficient free cash to make the purchase, an unlikely situation if it is, indeed, of low credit standing. Should the company need to raise funds for the repurchase, we might expect that the 80 of funds raised would need to pay 11% interest. We are then back to the original argument as to whether the additional cost of supporting this debt should be reflected in the value placed on that debt in the balance sheet.

These arguments are complicated further by extending the example to consideration of the value to place on debt at issue. If it is not the amount raised (which does allow for the credit standing of the company), then there is a profit or loss reported due to issuing the debt (generally a loss). An initial allowance for credit standing also implies that later changes in credit standing will also result in a profit or loss, as the value of debt is down graded or up-rated.

B3.3 *Example 2*

We now turn to the valuation of an insurance liability. Take an insurance company with a single policy, an endowment with added term assurance cover, say, that pays a basic sum assured of 100 with an estimated probability of 90% and an enhanced sum assured of 200 with an estimated probability of 10%. Solvency, interest and other complicating assumptions are ignored entirely, so we have a fair value of the liability of 110 ($= 100 \times 90\% + 200 \times 10\%$).

If we further assume that the company has assets of 110, it seems reasonable that the fair value of the company should be 0, as it could pass both assets and liabilities to another insurance company to settle all of its liabilities and be left with no value.

Should the insurance company choose to meet its own liabilities without a third party settlement, however, its value changes. In 90% of outcomes it will be able to settle those liabilities for 100 and will have a residual value of 10. In the remaining 10% of cases it will have inadequate funds to the tune of 90 (200 sum assured less 110 assets). It will become insolvent, with the policyholder meeting the cost of that insolvency. To a shareholder, the value of the insurance company is 9, as in 90% of cases he will end up with net assets of 10. A fair value approach allowing for the actual credit standing of this insurer should recognise this value and could do so by valuing the liabilities at 101 (i.e. $90\% \times 100 + 10\% \times 110$).

Presentationally, it is hard to argue with a value of assets of 110 and a value of liabilities of 101 under a fair value approach. Equally, however, it is

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hard to see how comparability can be preserved if different companies value the same liabilities at different amounts. It would surely be unreasonable to expect the user of the accounts to be able to bridge the difference between the two liability figures due to the allowance for credit standing.

B3.4 *Practical Application*

The above examples do not address the issue of how credit standing could be incorporated into an insurance company's assessment of the fair value of its liabilities. For liabilities that can be valued using replicating portfolios, the practical implementation should not be too onerous. If the liabilities are valued in relation to a replicating portfolio based on risk free assets and a risk free yield curve, then the credit standing assumption is, effectively, that those liabilities will always be paid. If, however, the replicating portfolio and associated yield curve are based on, say, AA rated corporate bonds, then the value of liabilities effectively incorporates the markets allowance for this level of credit standing. It would, therefore, be appropriate in respect of an AA rated insurance company.

This methodology effectively assumes that the market allowance for risk inherent in corporate bond cash flows is the same as that that would apply to any other cash flow, in particular the cash flow arising from insurance liabilities. Providing that those insurance liability cash flows have been assessed on a basis that incorporates appropriate allowances for the non-financial risks, then this approach should be acceptable.

B3.5 *Commentary — Points in Favour of Reflecting Credit Standing in Valuing Liabilities*

The definition of fair value naturally implies that the value of financial liabilities should reflect own credit standing. For example, when an enterprise creates a liability by 'selling' a financial instrument, any rational investor buying that financial instrument will make an allowance in the price that they are prepared to pay to cover the risk of the enterprise defaulting. This allowance will depend on the enterprise's credit standing. Since the market price of the financial instrument reflects the enterprise credit standing, the fair value liability should, by definition, also reflect credit standing.

Allowing for own credit standing gives a more realistic valuation of an enterprise's equity. In theory, the enterprise could realise all its assets and settle its liabilities at fair value, with any excess representing equity. Not to allow for own credit standing in the liabilities would understate the true economic value of stakeholder equity, due to the existence of limited liability with its implied put option; i.e. should the enterprise be unable to meet its obligations the liabilities are settled by handing over the enterprise's assets.

Allowing for own credit standing is consistent with the fair valuation of assets, which allows for uncertainties due to credit and other risks borne by the enterprise. It is these risks that lead to own credit risk, and the fair value of

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the assets will be less than they would have been without the risks. For example, if a credit risk on an asset reduces because of a credit upgrade, then the fair value of liabilities, as well as assets, would increase.

Current accounting treatment effectively already reflects initial own credit standing where new capital is raised as cash. For example, two companies, both issuing a zero coupon loan note for 500 in five years with different credit standings, implying, say, 6% and 12% p.a. interest rates, would receive cash of 374 and 284 respectively. Each would, initially, record a liability at fair value reflecting the capital raised. It seems inconsistent to allow for initial own credit standing, but not to allow for changes in credit standing. Further, it seems inconsistent to allow for own credit standing at the time of raising new capital in the form of cash, but not where capital is effectively raised in other forms, such as services provided.

Allowing for the effects of changes in own credit standing with consequent changes in the fair value of financial liabilities represents similar treatment to that used for changes in interest rates. Changes in interest rates are reflected in liability values, with the consequent effect that a rise (or fall) in interest rates reduces (or increases) liabilities. This reflects the beneficial (or detrimental) effect of having borrowed at a lower (or higher) rate than the market currently demands. It is argued that a change in own credit standing, which impacts on the rate of interest at which a particular enterprise can borrow, should similarly be reflected. Not allowing for changes in own credit standing would also involve identical liabilities having different valuations, if capital from each liability were raised at times of different credit standing.

B3.6 *Commentary — Points Against Reflecting Credit Standing in Valuing Liabilities*

If the enterprise's credit standing changes, the market price of the financial instrument will change, and hence the fair value liability will also change. It seems objectionable, in principle, that an enterprise's liability should reduce as its credit standing falls, rather than remaining at a constant face value.

The existence of intangible assets will lead to an inconsistency between assets and liabilities. Not all of an enterprise's economic assets are taken account of in an enterprise's financial statements. Intangible assets that are excluded, such as goodwill, also impact on own credit standing. It follows that allowing fully for own credit risk in liabilities could involve inconsistency in the treatment of assets and liabilities. For example, including the effect of a change in credit standing without any offsetting amount in respect of intangibles would distort the true position.

Some argue that financial statements should reflect changes in external conditions, but not changes in internal conditions, such as own credit standing. If own credit standing is reflected, then stakeholder equity would never be less then zero, and the main accounts, as distinct from the notes to the accounts, would not show whether an enterprise could meet its debts.

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Allowing for own credit risk will not be easy, and will involve subjectivity. This would be particularly so where there was no observable market price for an enterprise's debts.

Other users of accounts may be misled. Normal allowance for credit standing is aimed at reporting to shareholders. It does not assist other potential users of accounts, such as prospective policyholders, to judge the overall financial position of a company.

B3.7 *Commentary — Further Overall Points*

Allowance for credit standing effectively means that an asset is incorporated into the balance sheet, representing the value to the insurance company of its option to become insolvent at zero cost in cases where its liabilities turn out to exceed its assets. Effectively, therefore, the issue revolves around the purpose of the accounts and the aims of the accounting standards. A focus on value to shareholders would tend towards allowing for credit standing in those accounts, whereas a requirement to report on an entity's ability to meet its debts suggests ignoring credit standing.

The regulatory influence that affects all insurance companies will have an impact, and will normally mean that, in practice, the issue of credit standing may not be particularly important. Providing that the regulatory regimes under which insurance companies operate ensure that all insurance companies have large amounts of additional regulatory capital supporting their liabilities, then it would be expected that insurance companies would all have high credit standings, and the inclusion or exclusion of an allowance for own credit standing would be of only minor practical significance. Unfortunately, however, 'normally' does not always apply. Insurance companies do get into difficulties on occasions, and find themselves in situations where credit standing is an all too important consideration. Accounts have still to be prepared in such cases, and hence the fact that credit standing will not be a particular issue most of the time does not prevent us from having to come to a view on an appropriate treatment in principle.

B3.8 *Working Party Views*

For general purpose reporting, there are sound grounds for making allowance for credit standing, but only in relation to liabilities whose credit standing would not be changed if they were traded. This probably applies to liabilities, such as loan notes, that are traded on a market; the company concerned could buy back those liabilities in the open market and cancel them.

The main mass of insurance liabilities of a company with a poor credit standing, if acquired by another company, would acquire the credit standing of the acquirer. The Working Party, therefore, favours an approach to producing fair values for liabilities that looks to the trading of those liabilities with a third party, and hence to the (good) credit standing of the

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insurance market in general, rather than to the individual company's own credit standing.

If the main accounts do not make allowance for credit standing, then it would be open to companies to include, in the notes to the accounts, an assessment of the impact on the company's liabilities of its own credit standing. This would be the asset referred to in Section B3.7, or the value of 9 in the example in the third paragraph of Section B3.3. It would be a very brave finance director who disclosed a material value, but it appears to be right, in principle, that it should be done, so as to allow shareholders to judge the value to place on the company.

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APPENDIX B4

SOME THOUGHTS ON THE PRACTICAL IMPLEMENTATION OF FAIR VALUE REPORTING FOR GENERAL PURPOSE ACCOUNTS

B4.1 *Replicating Portfolios*

Where a portfolio of assets, a replicating portfolio, can be constructed, that exactly matches an insurance liability in all possible outcomes, then the fair value of the liability can be determined as the market value of that portfolio. The valuation is objective, being set by the market, and does not require assumptions for future experience or for a discount rate.

For liabilities of known fixed amounts at known future dates, the replicating portfolio simply matches the term structure of liability cash flows by an appropriate selection of fixed-interest securities. As such, the concept is not new in actuarial fields.

Financial economic theory applies the concept more widely. It might be thought that a forward price on a share would require a subjective assessment of future returns on that share in order to determine an expected share price at the future date. However, this proves not to be the case, as the share could be bought today, and known financing costs (and expected dividends) are reflected in the forward price. In other words, a replicating portfolio exists consisting of a loan and the share, and the share can be delivered at a guaranteed cost equal to the current share price plus interest to the forward date. Further, market makers would not want to offer any other price, as this would only set up arbitrage opportunities.

The same technique can be applied to other less simple financial instruments, such as options, although the replicating portfolio would be expected to be dynamic, requiring continual adjustment, rather than being a static unchanging asset selection. Although a dynamic replicating portfolio can provide only a close, rather than an exact, match, because markets are not frictionless and not always sufficiently liquid, and because strategies to hedge changes in volatility are not perfect, it again follows that there is no requirement to make assumptions for future experience or a discount rate. The value of the financial instrument is simply the market value of the current replicating portfolio, which will be a (perhaps complicated) function of the market value of that instrument.

B4.2 *Some General Practicalities*

In an abstract world, where all risks were commoditised and tradable on deep liquid markets, then all risks could, in theory, be hedged, and a replicating portfolio would exist for all liabilities. In the real world, however, this is not the case, and markets are incomplete. Further, where significant uncertainty exists over possible future outcomes, markets can be expected to

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be inefficient. In such situations, a replicating portfolio will not exist, and valuation of the liability will require assumptions for future experience and rate of discount.

Markets are becoming increasingly sophisticated, with the result that more risks are becoming commoditised and tradable. Examples of financial instruments that allow hedging of risks, that were once thought to be unhedgeable, include forward and futures contracts, exchange rate and commodity contracts, options swaps and swaptions, mortgage backed securities, credit derivatives and weather derivatives. While these contracts are at different stages of development, they do indicate that, if the trend for more sophisticated financial instruments continues, there might come a day when insurance risks are readily tradable on financial, rather than on reinsurance, markets. Whether such an outcome is feasible is a matter for conjecture, but, in any case, irrelevant for valuing many insurance liabilities at the current time. The lack of suitable replicating portfolios for many insurance liabilities means that the valuation of those liabilities will have to fall back on traditional cash flow projections, requiring assumptions for future experience and for a rate of discount.

Where liability cash flows are known with certainty, both amounts and timing, the amounts can be discounted in line with the term structure for interest rates, to produce the same value as the value of the replicating portfolio consisting of fixed-interest securities. The cash flow method applied in this way can, therefore, be seen to be consistent with a replicating portfolio method. Where liabilities depend on other financial measures, for example share prices and indices, but without optionality, a single deterministic cash flow projection, on market consistent assumptions, should again produce the same value as for a replicating portfolio. Where optionality exists probability distributions come into play, and stochastic rather than deterministic cash flow projections are needed. Again, providing the underlying assumptions are market consistent, the derived value should be the same as for the replicating portfolio, assuming one existed.

For those elements of experience where financial markets do not provide a market price, assumptions will be needed for the best estimate future experience and for market value margins to reflect the margin that the market would require for assuming the relevant risk. This, necessarily, will involve subjective assessment, as the notion of market consistent assumptions will not exist.

For business without obviously matching assets, the replicating portfolio would be derived by first projecting the liability cash flows (including market value margins) on different investment scenarios (perhaps thousands of scenarios). Different asset portfolios would then be 'fitted' to the liability cash flows. Only assets available in the market and consistent with regulatory constraints would be used. Derivatives would be used to hedge options. Subject to this, the assets would be as risk free as possible. An optimisation

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rule would be required to select the replicating portfolio, by minimising the asset/liability cash flow mismatches over time.

The practical application of this process could be simplified by, for example, associating the most suitable asset types to the different elements of cash flows, in order to determine appropriate discount rates and a present value of the cash flows. In some cases, it may be satisfactory to project cash flows on the basis of solely best estimate assumptions, and, where a reasonable derivative based hedge of options/guarantees exists, to value those options/guarantees directly from the derivatives.

For non-profit insurance business where the liabilities are independent of the actual assets held, those assets would not affect the value of the liability. It follows that the fair value liability would be the same whether liabilities were closely matched or whether an office adopted a mismatched strategy with potential greater reward. The actual assets held, though, would affect reported profits, the volatility of those profits and the risk of insolvency. As such, it would seem appropriate for there to be some disclosure of mismatch risk in the general purpose accounting statements, and for capital adequacy requirements to reflect the extent of any mismatch.

For unit-linked and with-profits business, the actual assets held will affect the liabilities, and so it follows that the replicating portfolio will depend on those assets, though allowance would need to be made for options/guarantees. The replicating portfolio for with-profits business will be complex, because of underlying guarantees, discretion applying to bonus and investment policy, and because risks are shared by policyholders.

B4.3 *Applications*

The following paragraphs consider how this theory might, in practice, be applied to non-profit, unit-linked and with-profits business.

B4.3.1 *For non-profit business*, where liabilities are independent of the backing assets, the basic liability will be the discounted value of the liability cash flows plus market value margins determined by the directors (see ¶B4.3.4). The discount rate will be the risk-free rate on a cash flow matching portfolio (to be consistent with financial economic theory), which would comprise fixed-interest and indexed-linked (for expenses) gilts. There would also be an additional liability in respect of any options.

B4.3.2 *For unit-linked business*, the basic liability could be based on the current unit value, perhaps less any immediate surrender penalty. This basic liability will need to be adjusted by:

(1) sterling reserves (positive or negative) based on discounted non-unit cash flows (e.g. charges and expenses), including market value margins; the discount rate used will be the risk-free rate on the asset portfolio that cash flow matches the non-unit liabilities; this portfolio may, for example, be a mix of short holdings in units in respect of income from

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future charges (for which cash flows will be discounted at the fund earned rate) and other assets, such as fixed and index-linked gilts; and
(2) the market value of options and guarantees (see ¶B4.3.5).

B4.3.3 *For with-profits business*, the basic liability could be based on the asset share, perhaps less any deduction implied by the 'PRE surrender value', i.e. the proportion of (smoothed) asset share targeted on claim, perhaps less any immediate surrender penalty. The basic liability will need to be adjusted by:
(1) sterling reserves (positive or negative) in the case of 'smoothed unit-linked' business, for which the profile of charges and expenses differs, based on discounted cash flows, including market value margins. The discount rate will follow similar principles as for linked business, the backing assets for the replicating portfolio being a mix of short with-profits assets and other risk free investments;
(2) expected smoothing profits or losses due to actual claim values differing, in the short term, from asset shares less surrender penalties, if appropriate (this could be due to smoothing or guarantees applying). The discount rate will follow similar principles as for sterling reserves; and
(3) the market value of options and guarantees.

In practice, the sterling reserves and smoothing costs for with-profits business might be calculated stochastically, or by deterministic cash flow projections, or via a traditional BRV type calculation, but with different discount rates for the different types of cash flow. To all intents and purposes, the effect would be to increase liabilities for with-profits business to the current fund value, including accrued terminal bonus, plus any additional reserve required to cover expected smoothing costs and the value of options and guarantees.

B4.3.4 Liability cash flows will, in general, vary with mortality, morbidity, expenses and persistency. These items will, in turn, vary according to the nature of each entity's business. Since no market proxy can be universally applied, best estimate assumptions of mortality, morbidity, expenses and persistency should, on practical grounds, be based on the entity's own expectation. The level of uncertainty in the assumptions, and their future development, are likely to be (at least a bit) more generic (e.g. mortality will vary with population mortality improvement, lapses will vary with economic and regulatory circumstances, and expenses with RPI). Hence, it would seem reasonable, on practical grounds, for 'guidance' to be given on appropriate levels of market value margins, from which directors would depart only with (disclosed) justification.

B4.3.5 Where financial options and guarantees can be hedged, then the liability will, by definition, be the market price for the hedge. Where financial options and guarantees are significant, and cannot be hedged,

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then they should be valued using stochastic models with state price deflators. Minimum modelling standards would be specified in 'guidance'. Alternatively, companies could use more prudent deterministic rules specified in 'guidance'.

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APPENDIX B5

RISK CATEGORISATION

B5.1 In Section 6.5 reference is made to the IAA's discussion paper (IAA, 2000b), and its categorisation of risks into eight types for the purpose of determining economic capital requirement. Economic capital is defined by the IAA as the capital needed to protect against the change in value of the business, such that the likelihood of default, undesired impairment, or insolvency of the company over a given time horizon, is less than a specified confidence level. This appendix provides more detail of that categorisation, and compares it with systems of categorisation already in use, or being developed for other financial institutions (n.b. the Working Party is aware that the IAA has continued its studies on risk categorisation, and is preparing a further paper on the subject, which, however, has not yet reached the point of publication).

B5.2 *IAA Classification*

B5.2.1 Risks here are taken to mean the factors which may produce a net change in the fair value of an insurer (fair value being the difference between the fair values of assets and liabilities). The IAA paper classifies these risks into eight categories: credit, transfer, market, business, operational, mortality, morbidity and property/casualty. These are now taken in turn.

B5.2.2 *Credit risk*. An insurer is exposed to credit risk in three main areas: in its investment portfolio, through risk of default of issuers of securities; via its business counterparties, for example reassurers; and where it has specifically granted credit, for example unearned commission paid to brokers. However, some of these will have been taken into account in the determination of fair value of the corresponding asset, for example credit risk is priced into the market value of a bond. In determining economic capital requirement, only credit risks not allowed for in the determination of fair value need be covered .

B5.2.3 *Transfer risk*. This risk embraces situations such as the inability of a group parent to move capital around its subsidiaries to match emerging risks because of foreign exchange controls (and, in that context, that the amount of capital available can be affected by fluctuations in currency exchange rates). Similarly, it also embraces situations where an issuer of securities held by the insurer is prevented from meeting its obligations through inability to obtain the currency needed (possibly through sovereign action, hence the risk is sometimes called sovereign risk). Note that this is different from credit risk, in that the issuer has funds available to meet its obligations, but these are frozen or in the 'wrong' currency.

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B5.2.4 *Market risk*. This is defined as the risk of volatility in the difference between the fair values of assets and liabilities, stemming from changes in parameters determined by market forces, for which suitable hedges either exist or, in principle, could exist. Thus, this risk includes fluctuations under the influence of changes to interest rates or equity prices where assets and liabilities are voluntarily mismatched.

B5.2.5 *Business risk*. This is the risk that comes directly from the insurer writing business. It covers changes in business already written at the balance sheet date, through, for example, fluctuations in persistency, and, since we are considering economic capital requirement, fluctuations in new business expected to be written during the given time horizon (see definition of economic capital requirement above), other than through risks covered above, and those specific risks (mortality, morbidity and property/casualty) covered below.

B5.2.6 *Operational risk.* Operational risk is the risk associated with one-off events, such as fraud, systems failure, litigation, regulatory breach, etc. In the current environment, this risk has a high profile.

B5.2.7 *Mortality, morbidity and property/casualty risks.* These are what one would expect them to be; i.e. in each case the risk of changes in claim rates or claim sizes affecting the insurer's cash flow.

B5.2.8 It is worth noting that categorising risks in this way can, unless care is exercised, overstate aggregate risk. Thus, whilst within mortality risk an insurer writing both term assurances and deferred annuities with no return on death over similar age ranges may be able to offset the effects of mortality changes across the two classes of business, it is not so apparent that this can be done across categories. An example of the latter might be the effect that changes in economic factors have on market risk, and, through persistency, business risk.

B5.3 *Other Classifications*

B5.3.1 As the IAA paper says, this is only one way of classifying risks. However, the IAA paper gives as an advantage that its suggested method is consistent with the classification used by other financial institutions. This allows comparisons across institutions, and the use of tools for assessing economic capital requirement developed in one area to be used in another. In the context of a growing number of financial conglomerates comprising different types of institution, and regulators keen to apply common standards, both internationally and to all types of institution to prevent regulatory arbitrage, such comparability and exchangeability may be regarded as the 'Holy Grail'. This section looks at one specific example as to how this is being realised.

B5.3.2 In March 2000 the FSA published a paper in the Occasional Papers Series, 'Some Aspects of Regulatory Capital', by Richardson & Stephenson (FSA, 2000b). As such, this is not a definitive statement of the

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FSA's views, rather a set of ideas to stimulate debate. However, it may be indicative of the way that the FSA is thinking, and, in that context, the remarks in the paper regarding banks is of relevance when one bears in mind the FSA's avowed intention:

> " ... as far as possible, to level the playing field between banks and insurance companies, so that risks of similar kinds are treated in similar ways for capital purposes, no matter where they are booked. And we also propose to use the conceptual framework, being developed by the Basle Committee in its review of the Capital Accord, for use in insurance too." (Howard Davies, Chairman FSA, speech in Munich, 26 April 2001).

The Occasional Paper referred to above outlines the current methodology used by the FSA when looking at risks run by banks. The risk-weighting framework used by the FSA takes specific account of credit risk and market risk. However, other risks are not specifically identified, for example what the paper calls control risks, and it also cites some operational risks such as those associated with custody and corporate finance which do not attract a need for capital under the current model. However, the FSA does take account of such risks in its supervision of banks through a risk-based regulatory framework called RATE. This looks at business and control risks, and aims to capture all elements of risk, both those which can be captured quantitatively and those which cannot.

B5.3.3 Whilst the Basle Agreement sets minimum capital requirements, the FSA sets higher trigger ratios, breach of which requires notification by the bank concerned to the FSA. In setting these trigger ratios, the FSA has regard to the following:

(1) the character of the bank (size, risk profile, the volatility of its earnings);
(2) the character of the markets in which it operates (political and economic stability, price volatility, etc.);
(3) diversification of activities and types of assets;
(4) the degree of concentration of counterparty exposure;
(5) the experience and quality of management and other personnel;
(6) the adequacy of systems and controls;
(7) shareholder/controller support and control;
(8) degree of supervision by other regulators; and
(9) risks arising from off-balance sheet assets, e.g. from securitisation.

It can be seen that some of these are related to transfer risk, operational risk and business risk, as defined by the IAA. Bearing in mind that credit risk and market risk are treated specifically, and that mortality, morbidity and property/casualty risks are specific to insurers, and do not apply to banks, one can see strong similarities between the two approaches. The major difference is the focus given by the FSA to controls or lack thereof, particularly those associated with management.

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B5.3.4 Following this, the FSA issued Consultation Paper 97 'Integrated Prudential Sourcebook' (FSA, 2001a). At the time, the FSA reaffirmed their commitment to a common approach to identifying, describing and mitigating risks, and that the same systems and controls will apply to all sectors. Risks are categorised into: market risk, credit risk (including risk concentration), operational risk, insurance technical risk, liquidity risk and group risk (the risk arising from membership of a group of firms). The similarity to the IAA classification is apparent. The FSA expect these proposals to provide a platform from which to incorporate the revised Basel Committee Capital Accord and other new international standards, once these are agreed.

B5.4 *Conclusion*

It may, we think, be safely assumed that harmonisation across different types of institution of the way risks are assessed and controlled, both through analysis of control systems and through provision of specific capital requirements to meet specific risks by regulators, is on its way. We are in agreement with the thrust of such developments, but would sound two notes of caution:

(1) The magnitude of the task should not be underestimated.
(2) Attention should be paid to the danger of ignoring offsetting factors crossing the boundaries of different categories of risk.

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APPENDIX B6

AN INTRODUCTION TO DEFLATORS

B6.1 *Introduction*

B6.1.1 Stochastic modelling of investment returns has been carried out in actuarial circles for many years. Many different models have been developed, and much has been written about the projected consequences of a variety of life office or pension scheme strategies when viewed in the context of stochastically generated future economic and investment scenarios.

B6.1.2 While such investigations can be useful in terms of the pictures of possible future outcomes which they paint, translating the future projections into present values is hampered by the issue of what discount rate(s) to use.

B6.1.3 Traditional actuarial thinking has tended to use a single discount rate for all elements of future cash flows, with whatever degree of prudence is considered appropriate for the purpose of the calculations built into the rate. While this can be fine for certain purposes, such an approach has the disadvantage that it can produce present values which are not necessarily consistent with current market values. For example, if you were to project forward stochastically the proceeds from a portfolio consisting of £100 of gilts and £100 of equities, and then discount back the mean cash flows at the same discount rate, you almost certainly would not get the same answer for the two parts of the portfolio, nor might either be equal to £100!

B6.1.4 Of course, with the benefit of hindsight, it would be possible to derive risk discount rates which would produce market-consistent present values. However, you would end up with different rates for different asset classes, and then be faced with the issue of how to choose the risk discount rates to use for policy cash flows which could be dependent on an asset mix which could vary over time, as well as non-investment factors.

B6.1.5 Deflators address such issues, and provide a means by which stochastically projected future cash flows can be converted into present values which are consistent with market prices, while still allowing for any anticipated differences in expected volatility of returns between asset classes.

B6.1.6 The purpose of this appendix is to give a flavour of the topic through a reasonably high level treatment — a kind of: "All you ever wanted to know about deflators, but were afraid to ask'' approach! Those readers who wish an 'in depth' consideration of the subject are referred to Jarvis, Southall & Varnell (2001), and the references listed therein.

B6.2 *What are Deflators?*

B6.2.1 Deflators can be thought of as stochastically-generated discount factors, as can be seen from the following.

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B6.2.2 By way of example, suppose you had a stochastic investment model which generated projected returns for, say, three asset classes: long gilts, equities and cash. For simplicity, let us assume that, at each time period, the model produced a single number for each asset class, being the total return (combining income and any capital movements) over that period. Thus, after 1,000 simulations, each over 20 time periods, you would end up with 1,000 * 20 * 3 numbers.

B6.2.3 If the model had been adapted/developed to produce deflators, you would have ended up with 1,000 * 20 * 4 numbers instead. Basically, what would happen is that, at each time period, the model would produce four numbers: the three asset returns as before, plus a deflator, particular to that time period and that projection run.

B6.2.4 Suppose you wish to value a liability in, say, ten years' time, the size of which is a function of investment returns over the period.

B6.2.5 Suppose further that you have run the stochastic model introduced above 1,000 times, and derived the resulting ten-year liability for each of the simulations.

B6.2.6 In order to arrive at a present value for the liability, the ten-year liability from each of the projections should be multiplied by the ten-year deflator from the same simulation, and an average taken over the resulting 1000 products.

B6.2.7 Thus, each deflator can be thought of as a sort of 'v^n' factor (a term familiar to many readers from their early actuarial training), particular to a specific time period and a specific projection run of an appropriately-developed stochastic investment model.

B6.2.8 It is worth noting that a single deflator from a specific projection run is not of much use! It is the set of deflators generated in respect of a given time period which is needed, since the market-consistent present value is obtained as the average of the deflated projected cash flows.

B6.2.9 Of course, the 'deflated present value' is only market-consistent if the stochastic investment model used is appropriately calibrated. This will be considered further later in this appendix. First, however, we look at a specific example.

B6.3 *What might Deflators look like?*

B6.3.1 The authors are indebted to Michel Abbink for generating the numbers behind the following example. (We could consider putting the spreadsheet on the actuaries' website to let people 'play' with the numbers.)

B6.3.2 Suppose we wish to price a call option (i.e. right to buy) on a particular stock in ten years' time. The current price is, say, 1 and the option exercise (or 'strike') price is set at 1.5.

B6.3.3 Such an option could be priced using the Black-Scholes approach. On the basis of assumptions consistent with the stochastic result presented below, the price would be 0.395.

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B6.3.4 Five thousand stochastic simulations were carried out to project the liability under the call option, using a stochastic model which generated deflators as well as the necessary asset returns. The following table shows the results of the first five projections by way of illustration.

	Projected values at time ten			
Run number	Stock price	Value of call option	Deflator	Deflated call present value
1	1.072	0	0.633	0
2	0.425	0	0.863	0
3	1.796	0.296	0.533	0.158
4	4.778	3.278	0.385	1.262
5	4.437	2.937	0.395	1.159

It is interesting to note that, the higher the projected stock price, the lower the associated deflator. This feature is not unique to the first five simulations, but more of that later.

B6.3.5 In order to arrive at a present value of this call option, the average of the 5,000 deflated values of the projected option costs was calculated. On the basis of these 5,000 runs, the answer was 0.395, the same as the Black-Scholes price, thereby demonstrating market consistency.

B6.3.6 Had a smaller number of projections been used, the answer would not necessarily have converged to the market price, as the following table shows.

Number of runs	Average deflated cost
1,000	0.429
2,000	0.404
3,000	0.396
4,000	0.392
5,000	0.395

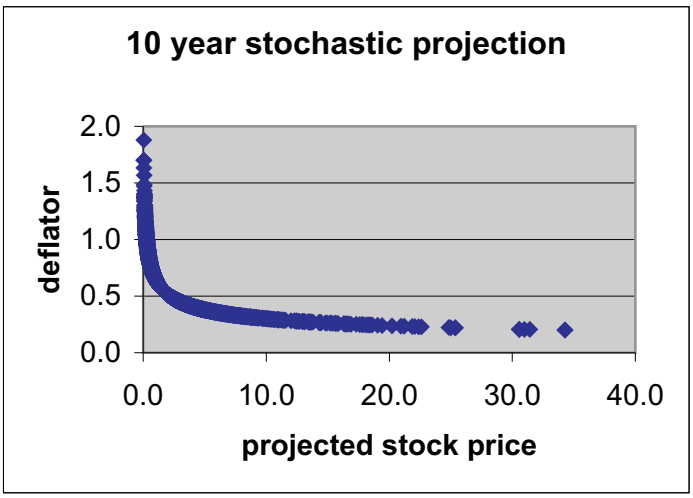
The reason for this is that, for the cost of the option, we are particularly interested in those simulations which produce a projected stock price in excess of the strike price 1.5. As the following table (which is based on the results after ranking them according to projected stock price) shows, fewer than half of the runs satisfy this.

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Projected values at time ten

Run number	Stock price	Value of call option	Deflator	Call's deflated present value
1	0.041	0	1.879	0.000
10	0.099	0	1.400	0.000
100	0.213	0	1.086	0.000
1000	0.641	0	0.752	0.000
2500	1.423	0	0.576	0.000
4000	3.121	1.621	0.444	0.719
4900	10.175	8.675	0.299	2.596
4990	22.613	21.113	0.229	4.841
5000	34.269	32.769	0.200	6.541
average	2.23	1.10	0.607	

Thus, the rate of convergence of the average deflated value will be a function of how 'lumpy' the upper tail of the distribution is. As the following figure (which plots each of the 5,000 pairs of ten-year stock prices and deflators) shows, there is a reasonable amount of 'lumpiness' — hence the need for 5,000 simulations.



B6.4 *Properties of Deflators*

B6.4.1 As should be clear from the above, an individual deflator's value depends on the economic scenario projected for the relevant time period, but not on the asset mix assumed for any backing assets contributing to the

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cash flow to be deflated. Thus, for example, the same deflator would be used to deflate a cash flow arising from fixed-interest investments as for one (at the same time period in the same projection) arising from equities. In particular, deflators could be used to value a series of fixed (i.e. risk-free) cash flows — admittedly, this could be using a 'sledgehammer to crack a nut', but the answer would be consistent with discounting at the risk-free rate (see ¶B6.4.4).

B6.4.2 While Section B6.3 does not prove the point, it is possible to demonstrate that, in the context of a positive expected equity risk premium, deflator values increase with the unattractiveness of scenario outcomes. This is a consequence of the risk aversion inherent in a market where the expected rate of return on risky assets is greater than that on risk-free assets. Intuitively, risk aversion means that someone will place a higher value on a fixed payment in times of adversity than in times of plenty.

B6.4.2.1 In general, people are risk averse, and deflators, therefore, reflect this. Were the opposite to be the case, and equity risk premiums were negative (albeit a strange concept!), then the figure in Section B6.3 would look very different.

B6.4.2.2 Another way of looking at this feature of deflator values is through utility theory. Assuming investors act to optimise expected utility, it can be shown that deflators are proportional to the marginal utility of the optimal portfolio (where marginal utility refers to the gradient of the utility function, and so measures the attractiveness of an additional unit of wealth, given a particular set of circumstances for the investor). If investors are risk averse, then marginal utility declines with increasing wealth. Hence, deflators are smaller in the more favourable outcomes.

B6.4.3 It can also be demonstrated that deflators must be positive. This follows from the 'principle of no arbitrage', which is so important in much of financial economics. An arbitrage exists where two separate (portfolios of) assets have exactly the same future outcomes, but different prices now, or, alternatively, exactly the same price now, but one has future outcomes which are never less, and in at least one future scenario are greater, than those from the other asset (or portfolio). If a market were to permit (other than very short-term) arbitrage opportunities, it would not be possible to put a unique market value on future cash flows. In fact, it would even be possible to put negative present values on positive future cash flows! Conversely, where no arbitrage is assumed to exist, market prices for future positive cash flows must be positive, and, as a consequence, so must deflators.

B6.4.4 There is an interesting relationship between the deflators calculated for a particular time period and the price of a risk-free investment for the same period. The expected value of the former is equal to the risk-free discount factor for the period in question. Put another way, as the number of stochastic simulations rise, the average of the deflators calculated in respect of time t will tend to v^t, where v is calculated at the risk-free rate of return.

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B6.4.4.1 By way of example, in the calculations presented in Section 6.3, the underlying risk-free force of interest assumed was 5% p.a., giving rise to a ten-year risk-free discount factor of 0.6065. The following table shows how the average deflator moves with the number of simulations.

Number of runs	Average deflated cost
1,000	0.6018
2,000	0.6085
3,000	0.6084
4,000	0.6070
5,000	0.6065

While convergence to two decimal places happened quite quickly, several thousand simulations were needed before greater convergence was seen.

B6.4.4.2 It is worth noting that the deflated cash flow value is the average of the individual deflated cash flows, and not the product of the average cash flow and the average deflator. The latter, of course, is akin to a 'traditional' actuarial present value on a set of average assumptions, with the discounting done at the risk-free rate.

B6.4.5 Deflator values need not be unique. Where markets are assumed to be complete (by which is meant that any possible contingent claim can be replicated, and hence hedged with available securities), it can be shown that deflators are unique (up to a constant multiple). Where markets cannot be assumed to be complete, some other criterion (for example utility, as mentioned earlier) is needed to determine the deflators to be used.

B6.4.5 *Do all stochastic investment models automatically produce deflators?*

B6.4.5.1 No. An investment model needs to be specially adapted with the appropriate mathematics added. There are various such models in the public domain, and, presumably, other more sophisticated models subject to more commercial constraints.

B6.4.5.2 A second approach to deflator generation has been developed for use with stochastic output which does not contain deflators. This was used to derive the deflators presented in the five-state example in Section C.3. The idea is essentially to assume that the, N say, scenarios stochastically generated represent all possible states of the investment world. The calculation of the N deflators for a particular time period then amounts to a (very complicated) piece of numerical analysis. Again, there is some material on this in the public domain, and other more advanced thinking subject to commercial constraints. From what is publicly available, it is not clear whether this second approach is a genuine alternative to the model generation of deflators in ¶B6.4.5.1, or whether it is only suitable for use in certain specific situations.

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B6.5 *Are Deflators right?!*

B6.5.1 This is similar to asking: "Is financial economics right?"! The answer, in practice, really depends on how 'good' the model is from which the stochastic results have been generated.

B6.5.2 One of the comforting aspects of deflators is that it is straightforward to check whether or not the underlying model is consistent with the market (both in terms of design and calibration of assumptions). All that you need to do is to attempt to price a selection of readily-available option contracts. If the model does not produce deflated values consistent with available market prices (after allowing for relevant profit margins), something is wrong!

B6.5.3 Whether or not such an approach produces the 'right' answer for a particular cash flow is possibly a question that can never be answered. A market value represents the price at which a buyer and seller are prepared to settle in a particular set of circumstances. Where issues of supply and demand affect this equilibrium, it is possible to envisage situations where actual risk and perceived risk (as implied by the market price) were to differ. From the point of view of general purpose reporting, it may be adequate to rule out such arbitrage opportunities by taking the view that the 'perceived' risk is the 'correct' one to use. For prudential solvency reporting, however, attention would need to be paid to such possibilities, which has implications for the design and calibration of any stochastic model used for the derivation of the amount of risk-based capital which should be held.

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APPENDIX C

SAMPLE CALCULATIONS AND PRACTICAL ISSUES

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(The Fair Values Calculation Group)

C.1 *Introduction*

C.1.1 This note presents the results of work carried out by the Fair Values Calculation Group, which was set up jointly by the Life Accounting Issues Committee and the Fair Values Working Party. The group consisted of members of the Faculty's Bonus and Valuation Research Group, along with individual volunteers from the Institute of Actuaries. The purpose of the group was to provide sample calculations of fair values for different policy types, and to highlight practical difficulties encountered in arriving at the numbers.

C.1.2 The group considered two methods of determining fair values: replicating portfolios; and stochastic modelling with deflators. Practical issues of both are discussed here.

C.1.3 The calculation of fair values requires judgement, and Section C.7 outlines the areas where judgement is required.

C.1.4 The group is grateful to the Fair Values Working Party for their guidance. The group would also like to thank Andrew Smith for providing a calibration of the reduced Smith model which was used to prepare the stochastic model output. The results presented below are those of the Calculation Group, and any errors and omissions remain its own.

C.2 *Issues relating to the 'Replicating Portfolio' Method*

C.2.1 A replicating portfolio is a portfolio of assets with observable market prices whose cash flows match those from a book of insurance contracts.

C.2.2 If an insurer identifies a replicating portfolio, it should value the matching cash flows having regard to the fair values of the assets in the replicating portfolio. The simplest example of this is a guaranteed non-profit product without mortality risk, which can be perfectly matched by a risk-free zero coupon bond.

C.2.3 In the presence of insurance risk, the replicating portfolio is the value of assets matching the cash flows of the contract projected on 'best estimate' assumptions for the insurance risk. This means that no allowance is made for the volatility of the insurance risk. Although this might be correct in the theory of the Capital Asset Pricing Model, where insurance risk is

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viewed as diversifiable, it is indicated in the Draft Statement of Principles that insurance risk should be reflected in a separate margin for risk and uncertainty (the market value margin) in addition to the value of the replicating portfolio.

C.2.4 A key requirement of the replicating portfolio approach is that the market is complete (i.e. every maturity can be replicated with available assets). There must also be no arbitrage opportunity, in other words any two portfolios replicating the liability cash flows must have the same market value.

C.2.5 It is important to note that the portfolio actually held by the insurer need not be the replicating portfolio. The method, therefore, does not imply that the measurement of assets affects the measurement of liabilities.

C.2.6 Although the method is theoretically sound, its requirements are not necessarily satisfied in practice.

C.2.7 Firstly, depending on the nature of the business to be valued, we may require the market to provide spot yields for durations of 40 years or more, which it currently does not. To overcome this, it may be possible to extrapolate the yield curve to obtain spot yields at the very long durations. This may not be a great problem in practice, because of the relatively low value of the very long cash flows. It should be noted that, as discussed in ¶C.5.7, this is also a problem for the calibration of a stochastic model if deflator methodology is used.

C.2.8 Secondly, whilst possible for non-linked non-profit contracts such as annuities and term assurance, it is much harder to apply the replicating approach to unit-linked and with-profits contracts, where future liabilities depend on the performance of the actual assets and bonuses are, to some extent, discretionary. The observed correlation in savings products between surrender rates and economic scenarios complicates things even more. The authors believe that these contracts are so complex that the stochastic approach discussed in Section C.3 will have to be taken.

C.2.9 The presence of guarantees in a product does not necessarily rule out the replicating portfolio approach, as long as traded derivatives can be found that mirror those guarantees. For example, for guaranteed equity bonds a replicating portfolio could be constructed using prices for over-the-counter derivatives that the office is probably already holding as the backing assets. The current prices can be obtained from the providers. For certain continental European style endowments, where bonuses are linked to bond indices, it may be possible to value future bonus cash flows using financial investments like swaptions.

C.3 *Issues relating to the 'State Price Deflator' Method*

C.3.1 Those who have read the paper Jarvis, Southall & Varnell (2001), will already be familiar with the concept of deflators.

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C.3.2 For those who have not read the paper, deflators are a tool for calculating market consistent values of stochastically modelled cash flows. If an inward cash flow at time t has been modelled n times as $C_1, \ldots C_n$, then the present value of that cash flow is equal to:

$$(C_1 D_{1,t} + C_2 D_{2,t} + \ldots + C_n D_{n,t})/n$$

where $D_{m,t}$ is the time-t deflator relevant to the mth stochastic run. The deflators can be thought of as 'stochastic discount factors'. The average (over all values of m) of $D_{m,t}$ will be $(1 + i_t)^{-t}$ where i_t is the time-t yield. This ensures that zero coupon bonds are priced correctly. However, for different stochastic runs, $D_{m,t}$ will be different. Generally, the deflator will be higher in those stochastic runs where investment performance is poor, effectively putting more weight on those scenarios to reflect investors' risk aversion.

C.3.3 As an example of the use of deflators, consider the task of valuing a guaranteed equity bond. In one year's time, the bond will pay out the greater of £100 and the value of a pot of equities. The equities are worth £100 today. In this example, only five stochastic runs will be used, for simplicity.

C.3.4 The first step is to carry out the stochastic investment runs and to calculate the associated deflators. We might reach a set of figures like these:

Run	Equity value	Deflator
1	75.2	1.474
2	94.4	1.089
3	110.5	0.894
4	129.3	0.739
5	162.3	0.566

C.3.5 The method of calculation of the deflators is beyond the scope of this appendix, but, as evidence of the validity of this particular set of deflators, it can be demonstrated that they can correctly price equities and one-year zero-coupon bonds (which, in the calculation of the deflators, were assumed to have redemption yields of 5%).

		Equity		Zero coupon bond	
Run	Deflator	Cash flow	Cash flow x deflator	Cash flow	Cash flow x deflator
1	1.474	75.2	110.9	105.0	154.8
2	1.089	94.4	102.9	105.0	114.4
3	0.894	110.5	98.8	105.0	93.8
4	0.739	129.3	95.5	105.0	77.5
5	0.566	162.3	91.9	105.0	59.5
	average = current value		100.0		100.0

The value of the guaranteed equity bond would then be shown to be 108.5.

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Guaranteed equity bond

Run	Deflator	Cash flow	Cash flow x deflator
1	1.474	100.0	147.4
2	1.089	100.0	108.9
3	0.894	110.5	98.8
4	0.739	129.3	95.5
5	0.566	162.3	91.9
	average = current value		108.5

Of course, being based on only five stochastic runs, this is not an accurate figure.

C.3.6 The first issue surrounding the state price deflator methodology is the challenge to traditional actuarial thinking. One of the key theoretical hurdles to get over is that the market price of a cash flow is not a function only of that cash flow's distribution. Instead, it is important to establish how the cash flow is correlated to other financial markets. Deflators allow directly for this. Simply taking the average cash flow and discounting back to the present would not (unless exactly the right risk discount rate could somehow be chosen).

C.3.7 Other issues are practical ones. A company intending to calculate fair values using stochastic runs needs to make a substantial investment in developing the necessary computer systems. A system would need to be written to carry out the stochastic runs and store them along with the associated deflators. They would also need to adapt their existing model office systems to be able to run thousands of times using investment returns loaded from the file of stochastic runs. Output from all those runs would need to be discounted back to the present using the deflators.

C.3.8 As well as the development time, the company would also need to think carefully about the processing time. In an ideal world, all valuations and accompanying projections would be performed on a policy-by-policy basis. Whilst this is now relatively easy to achieve for deterministic projections, policy-by-policy stochastic projections require such computing power that they are currently unlikely to be practical.

C.3.9 In the modelling work reported here, it was found that 1,000 stochastic simulations required several seconds of computing time. Reliable stochastic modelling typically requires around 10,000 simulations. Even allowing for, say, two orders of magnitude reduction in time by parallel processing, run times for a portfolio of 1 million policies would be of the order of years.

C.4 *Auditing*

C.4.1 The experience of the group was that the introduction of stochastic modelling and replicating portfolios to liability valuation added a degree of complexity to checking the modelling.

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C.4.2 In practice, whatever method is chosen will need to be audited, and therefore understood by auditors. The appropriate type and complexity of model will depend on the business. For example, in the U.S.A., where few products have options, stochastic modelling should not be necessary, as the deterministic cash flows can be discounted back using the yield curve. Products such as guaranteed equity bonds could be dealt with using a simple model, such as Black-Scholes. However, other product features, such as with-profits (in which a discretionary benefit is subject to a guaranteed minimum) and GAOs, will require modelling of movements in the yield curve.

C.4.3 It therefore seems likely that some degree of stochastic modelling will be necessary. A number of stochastic models exist, and this alone may mean that auditors will need to understand a number of different models. (It also introduces subjectivity and makes results less comparable.)

C.4.4 Whether standard models with standard calibration will ever be agreed (or be imposed by the regulatory authorities) is an important issue. However, whatever model is chosen, the auditors will need to check the output against known calibration inputs, e.g. the prices of bonds.

C.5 *Choice of Models and Calibration*

C.5.1 Arguably, there are only a few widely recognised investment models in the current actuarial domain. Even these models require a lot of parameterisation, and can give rise to reasonably different results, due to the fundamental mechanics underpinning them.

C.5.2 It is unlikely that companies will all use the same stochastic investment model. Different companies will have different products on their books, sensitive to different types of investment risk, and needing models that allow for those different risks. For example, a company that only sells guaranteed equity bonds linked to the FTSE might only need to model the FTSE, whereas a company writing forward starting annuities with an option to take a fixed cash amount rather than an annuity will want to model the yield curve. An office writing both lines of business will have to decide whether to use different models for each product or to use a unified model for equities and fixed-interest (with appropriate allowance for correlations between the two).

C.5.3 The structure of the stochastic model is also an issue. For example, could equity prices be modelled simply using a lognormal distribution? Or should this model be refined slightly to increase the probability of extreme price movements — something that lognormal models tend to understate? Should interest rates and investment returns show any mean reversion, or not? For the calculation of fair values, this is not as big a problem as might be thought. The model will always be calibrated to price assets correctly, and the price it places on liabilities can be thought of as an interpolation between the prices of similar assets, so different models should give broadly similar results.

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C.5.4 If, however, the model is to be used to determine risk-based capital, then the results will be highly dependent on the model structure. This would need to be borne in mind when comparing the RBC requirements of two companies with different asset models.

C.5.5 The calibration of a stochastic model is a more subjective task than might be thought. There is no 'correct calibration'. Instead, a company will need to set down its objectives for calibration. What assets should it be calibrated to? It probably depends on the products being modelled. For example, two portfolios of guaranteed equity bonds, one maturing one year in the future and one five years in the future, might use the same Black-Scholes equity model, but with different volatilities to reflect variation by outstanding term in volatilities implied by the market. To be fully consistent with fair value concepts, the variances and covariances within the model should be based on those implied by market prices of derivatives. For the covariances, there is the problem that derivatives whose values depend on those correlations may not even exist.

C.5.6 A calibration that is appropriate for fair value calculations may not be appropriate for risk-based capital calculations. For risk-based capital, it is particularly important that variances and covariances of returns on different classes are consistent with best estimates of future market behaviour. Market pricing of derivatives, used in calibrating a model for fair value calculations, can be at odds with these.

C.5.7 The correct determination of the yield curve is crucial to calibration of a stochastic model. This causes difficulty for cash flows beyond the long end of the bond market, e.g. in valuing annuity business as discussed in Section C.11. In such a case an assumption must be made about long spot forward rates. However, this is not a problem that is peculiar to deflator methodology. As noted in ¶C.2.7, it causes difficulty for replicating portfolios, and indeed for any method of calculating a fair value of very long liabilities. Fortunately, in practice the value of cash flows beyond the end of the market yield curve will usually be very small, and the consequent uncertainty in fair value is unlikely to be highly significant.

C.5.8 A general insurance company will need to allow for correlations between claims experience and investment markets and between claims in different business classes. For example, mortgage indemnity claims should be negatively correlated to property prices. This adds even more complexity to the model, and requires the estimation of large numbers of correlations.

C.5.9 Even if a calibration achieves its objectives, it is also necessary to check that the resulting model parameters are sensible.

C.6 *Bonus Policy for With-Profits Business*

C.6.1 A serious complication for with-profits business is the need to specify a bonus policy. A fairly simple bonus rule will be needed to make the modelling practical, but offices do not have a wholly formulaic approach to

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setting bonus rates. Indeed, the actuarial profession's Transparent With-Profits Working Party states that:

> "The most fundamental feature of with-profits is that benefits are subject to discretion. ... Full pre-determination of benefits (either as amounts or through the application of an unchangeable set of rules) is incompatible with the with-profits concept." Clay *et al.* (2001).

If the fair value is to reflect what bonuses are likely to be paid in the future, complex rules would need to be set out allowing for smoothing, solvency constraints, PRE, etc., ...

C.6.2 Even if a bonus rule can be modelled, there is the further complication that bonuses can hardly be determined from individual policy projections. In practice, offices must consider their portfolios in aggregate to be able to set bonus rates.

C.7 *Areas where Judgement will be Required*

C.7.1 As with current reporting, there will still be a need for considerable judgement. The IASB suggests that estimates could be thought of as two elements: a best estimate; plus a market value margin (MVM) to represent the margin that a third party would demand for taking the risk from the insurer.

C.7.2 Several methods have been suggested for determining actual MVMs from secondary markets, for example by reference to mortality reassurance rates. However, the view of the Calculation Group is that these methods are not feasible in practice, for several reasons:

(1) Even if a secondary market exists (for example the reinsurance market for mortality risks), the makers of the markets (reinsurers) are unlikely to be willing to provide quotes simply to allow insurers to prepare accounts.
(2) In many cases the secondary quote is company specific, reflecting a range of other factors, such as underwriting practice. As such, it is difficult to verify as a market rate.
(3) For many assumptions there is no verifiable secondary market.

C.7.3 Therefore, the Group believes that the reporting actuary must make judgements on the following (perhaps with guidance from a Standards Board):

(1) choice of best estimate assumptions for mortality, lapses, morbidity, etc.;
(2) correlation of non-economic assumptions;
(3) choice of the market value margins for mortality, lapses, morbidity, etc.;
(4) choice of stochastic model and or method of valuing cash flows;
(5) choice of assets for calibration of the model;
(6) specification of decision rules (bonus policy, variable charges, etc.); and
(7) grouping criteria.

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C.7.4 Although this list is extensive, many of these judgements are made currently by actuaries calculating embedded values. For an embedded value they may, however, be less explicit. For example, in an arms length transaction, market value margins are incorporated implicitly in the risk discount rate. There is also no widely accepted basis for such judgements, and work remains to be done to find methods of determining explicit margins that are appropriate for fair value calculations. In each of the sample calculations in Sections C.9 to C.12, the assumptions, if any, that have been made about market value margins are stated.

C.8 *Some Worked Examples*

C.8.1 The following sections set out worked examples for some simple policies.

C.8.2 In each example the fair value at a given duration is based on a deterministic past accumulation, with stochastic modelling of the future.

C.8.3 As noted in Section C.5, the calibration of a stochastic model is a complex task. For ease of calculation, the Group adopted a model calibrated to produce equity returns of 9% and bond returns of 7.4%. For the purpose of showing the fair value and statutory reserves, we have used returns consistent with the model. The Group recognise that these returns appear high in current market conditions. Time limitations have meant that the model has not been recalibrated. The model calibration would have been very different had we based a calibration on markets at the year end or at the date of writing, given, for example, the variation in the level and volatility of the yield curve and changes in the implied volatility of equities .

C.8.4 Fair value profit (shown for the annuity and term assurance examples) is the release, at each duration, of the difference between the value of the backing assets and the fair value of the liability. It is, therefore, worth noting that, whereas in most circumstances the fair value of the liabilities is largely independent of the nature of the backing assets, the profit is extremely sensitive to it. In the annuity and term assurance examples, it has been assumed that the office has backed the liabilities with replicating portfolios.

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C.9 *With-Profits Bond*

C.9.1 *Key assumptions*

Premium	£40,000
Bonus	60% investment return allocated to reversionary bonus
MVAs	Maximum 25% before time 10; no MVA at time 10
EBR	50%
Expenses:	
investment	0.1%
commission	5.6% premium
initial expenses	2.4% premium
charge all expenses to asset share	
no other charges	
Market value margins	None

C.9.2 The table below shows fair value, asset share, unit value and statutory reserve (including solvency margin). The values at time 0 are immediately after the premium is received, before any expenses have been incurred.

	Time					
	0	1	2	3	4	9
Fair value	41,075	40,808	43,899	47,361	51,037	73,724
Asset share	40,000	39,740	42,921	46,358	50,078	73,623
Unit value	40,000	42,000	44,000	46,131	48,348	61,148
Statutory reserve	38,399	41,398	44,492	48,261	54,038	84,156

C.9.3 No explicit charge has been made for the guarantee in this example, and, as a result, the fair value is greater than the asset share. If the office charged for the guarantee the fair value could be less than the asset share.

C.9.4 In the following table, the effect of limiting the MVA to 5% is shown. As expected, a higher guarantee increases the fair value liability. (In practice, it is very unlikely that any office would limit itself to a 5% adjustment if market values fell by 25%. Indeed GN8 specifically allows a higher MVA on mass lapse. The reserves may, therefore, be overstated.)

	Time					
	0	1	2	3	4	9
Fair value	41,545	41,198	44,150	47,514	51,115	73,724
Statutory reserve	52,693	55,328	57,963	60,770	63,690	84,156

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C.9.5 Some of the strain of the 5% limit on the MVA can be relieved by a reduction in the future reversionary bonus rates. This is illustrated in the table below, in which the reversionary rate is set to 40% of return.

	Time					
	0	1	2	3	4	9
Fair value	41,206	40,839	43,879	47,282	50,916	73,724

C.9.6 Removing the MVA guarantee at time ten would give a fair value equal to the asset share if the actuary really could apply an MVA aggressively.

C.10 *Unit-Linked Regular Premium*

C.10.1 *Key assumptions*

10-year annual premium	£1,000
Annual management charge	1%
Expenses:	
set up expense	£200
commission	Nil
running expense	£23.80 p.a.
MVM expense margin	5% to give £25 MVM expense in fair value
Expense margin for statutory reserve	10%
Sterling reserve	Only required for PUP in early years

C.10.2 The table below shows the fair value liability immediately before each premium is paid.

	Time					
	0	1	2	3	4	9
Non-unit fair liability	(113)	(150)	(184)	(212)	(232)	(106)
Unit fair liability	1,003	2,044	3,243	4,566	6,002	14,233
Total fair value	890	1,894	3,059	4,354	5,770	14,127
Unit reserve	1,000	2,080	3,246	4,506	5,867	14,487
Sterling reserve	108	8	0	0	0	0
Total statutory reserve	1,108	2,088	3,246	4,506	5,867	14,487

C.10.3 The non-unit value is the deflated value of charges less expenses. The total fair value is the deflated value of office cash flows. The unit fair value is then a balancing item.

C.10.4 If the policy had minimal fixed monetary liability, a reasonable

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approximation to the deflated liability could be achieved using a yield curve to discount expected cash flows. The unit growth rate used would be the same as the return implied by the yield curve. This approach would not work, however, if there were a significant mismatch between the unit growth and the benefit outgo, for example in policies with significant death or other rider benefits.

C.10.5 In practice, many unit-linked products offer the option of a death benefit of the greater of a fixed sum assured and the fund value. In this case the mortality cost can be compared to a put option with a strike price equal to the sum assured. If this option is valued in line with modern option pricing techniques, the fair value of the contract will depend on the assumed future volatility of the assets in the fund, and therefore on the mix of the assets. The general rule that the fair value of liabilities is independent of the backing assets, therefore, does not apply to such contracts.

C.11 *Annuities*

C.11.1 *Key assumptions*

Age at entry	65
Premium	£24,000
Annuity	£2,092 p.a.
Expenses	Industry standard
Market value margins	None
Mortality in reserving basis	75% PM80 (C = 2010) with 2.5% p.a. reduction from outset
Experienced mortality	85% PM80 (C = 2010) with 2.5% p.a. reduction from outset

	Time					
	0	1	2	3	4	9
Fair value	18,041	17,672	17,183	16,616	16,084	13,509
Statutory reserve	21,903	21,213	20,496	19,751	18,980	14,772
Fair value profit	5,611	0	0	0	0	0

C.11.2 The fair value effectively capitalises future margins. Because it has been assumed that the office is backing the liability with a replicating portfolio and that there are no market value margins, there is, therefore, no emergence of profit in later years. If market value margins, which are matters for the judgement of the reporting actuary, had been included in the fair value the future profits would have been the unwind of those margins.

C.11.3 Annuities (and in particular deferred annuities) highlight one of the problems with both the replicating portfolio and the deflator method. Both methods require assets with terms longer than available in the market. In the example here the yield curve has been extrapolated to provide the full range of required yields.

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C.12 *Term Assurance*

C.12.1 *Key assumptions*

Term	10 years
Annual premium	£420
Sum assured	£101,000
Expenses	Industry standard
Market value margins	None

C.12.2 The term assurance gives apparently odd results. It always produces a negative liability to the office (i.e. is an asset). On reflection, this makes sense. The premium can be thought of as a mortality loading + renewal expense loading + loading to recover initial expenses. Assuming the mortality loading and renewal expense loading are approximately correct, the 'fair value' at any point in time will be the capitalised value of future premium loadings to cover initial expenses. As the policy progresses, a reserve is needed for future mortality strain.

	Time					
	0	1	2	3	4	9
Fair value liability	(1,068)	(950)	(826)	(683)	(526)	369
Statutory reserve	216	398	552	683	795	1,082
EV (8.2%)	1,499	1,443	1,386	1,326	1,256	913
Fair value profit	291	0	0	0	0	0

C.12.3 As in the case of the annuity example above, it is assumed that the office backs the liability with a replicating portfolio. Since there are no market value margins, there is, therefore, no emergence of profit after the start.

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