Getting to grips with fair value

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1 Introduction

Fair value

1.1 The International Accounting Standards Board is in the process of developing a standard for the reporting of insurance contracts. This standard is commonly referred to as fair value. The International Accounting Standards definition of fair value is as follows:

"the amount for which an asset could be exchanged or a liability settled between knowledgeable, willing parties in an arm's length transaction"

1.2 Over the past year or so fair value accounting has become one of the most topical subjects for discussion within the insurance industry. Twelve months ago most actuaries would have heard of the concept of fair value but few would have been familiar with the above definition. The development of this important subject has been rapid and there has been much discussion in recent months on the technical issues surrounding fair value and how it should be applied in the context of insurance business.

1.3 This paper provides some background to the theory underlying fair value calculations and also comments on the unresolved issue and areas that are, in our view, unclear. However, the main purpose of this paper is to get to grips with the practical side of performing fair value calculations. We will seek to answer questions such as:

- How does one go about calculating the fair value of an insurance portfolio?
- How will moving to a fair value based system affect the emergence of profits?
- What business issues will arise from the introduction of fair value?

Intended audience

1.4 Fair value is likely to affect many aspects of the management of a life insurance company and this paper is intended to be of use to a variety of people. These will range from those responsible for performing fair value calculations to those responsible for solvency reporting, profit forecasting, product design, asset allocation and the general management of the business. Although the theoretical parts of the paper generally apply to life and non-life business, the practical sections concentrate on life insurance business.

Overview of this paper

1.5 This paper contains the following sections:

- a review of the background to the proposed introduction of a fair value based system for insurance accounting (section 2);
- a summary of the theory underlying the calculation of the fair value of insurance assets and liabilities (section 3);
- a summary of some of the key issues that are still to be resolved (section 4);
- a brief comparison of fair value and embedded value methodologies (section 5);
- examples of the practical approaches that may be used to perform fair value calculations (section 6);
- illustrative examples, comparing fair value, embedded value and prudential reporting results for conventional non-profit, unit-linked and unitised with-profit business (sections 7 to 9);
- consideration of the business issues that may arise as a result of the movement towards a fair value based system (section 10); and
- a brief summary and some conclusions (section 11).

1.6 If you have any comments on this paper then please email them to michel.abbink@eu.watsonwyatt.com or matt.saker@eu.watsonwyatt.com .

2 Background

A brief history

2.1 In contrast to most major industries, no official international standard for financial reporting for insurance contracts currently exists. This is true for both statements prepared in accordance with generally accepted accounting principles ("GAAP") and those prepared for regulatory purposes.

2.2 In 1997 the International Accounting Standards Board ("IASB"), formerly called the International Accounting Standards Committee, set in motion a project on insurance accounting. Their objective was as follows:

"To produce a single set of high quality, understandable and enforceable global accounting standards that require high quality, transparent and comparable information in financial statements"

2.3 The purpose of this project was to develop a standard of reporting for use in general purpose financial statements. This standard should address the needs of the many different users of the financial statements of an insurance company (e.g. potential investors, regulators, rating agencies) and should seek to produce accounts that meet the following criteria:

- they should be transparent to users;
- they should be easily understood by users; and
- they should be consistent from one entity to another.

2.4 More transparent and easily understandable accounts are clearly desirable. Ideally, although the financial statements of insurance companies can be complicated, you should not need to be an actuary or accountant in order to interpret them.

2.5 The requirement for greater consistency is also important and can be viewed on a number of different levels. Firstly, one could argue for consistency of reporting for a particular industry within one jurisdiction. Secondly, one could argue for consistency of reporting for the same industry in different jurisdictions (this is particularly important in an increasingly globalised world economy). Finally, one could argue for consistency of reporting between different sectors (e.g. insurance and banking) both within and between different jurisdictions. In the past, insurance and other financial services industries have been viewed as quite distinct entities. However, there now appears to be a trend and pressure towards creating a level playing field for all financial service industries.

2.6 The day to day running of the IASB project was delegated to a Steering Committee. This consisted of representatives from all the major insurance markets around the globe. Progress was initially fairly difficult; but in December 1999 the Steering Committee published an Issues Paper on insurance accounting and asked for feedback by the end of May 2000. A substantial amount of feedback was received both from the

insurance industry in general and from other interested parties (e.g. the actuarial and accounting professions).

2.7 The Steering Committee reconvened in September and November 2000 to discuss this feedback and then in April and June 2001 to develop a report to the IASB. This report took the form of a Draft Statement of Principles ("DSOP") setting out the principles of fair value which should be applied to insurance business. At the time of writing chapters 1 to 6 and 8 to 12 of the DSOP had been finalised and are available on the IASB web site (www.iasb.org.uk). A summary of the principles set out in these chapters is given in Appendix B. The remaining chapter on performance linked contracts is due to be finalised in the coming months.

2.8 It is important to note that, although the DSOP provides us with the best indication of how fair value will be implemented, its conclusions are still tentative and may therefore be changed at future IASB meetings. The principles of fair value accounting for insurance contracts will be finalised only after completion of a formal ballot and the issuing of an International Financial Reporting Standard.

The next steps

2.9 The next steps in the IASB project, together with tentative target dates, are as follows:

- Finalisation of the DSOP — Early 2002
- Field tests to assess the practical and conceptual implications — 2002
- Exposure draft of the accounting standard — Late 2002
- Final international accounting standard — 2003

2.10 Target dates for the implementation of the accounting standard are far from certain and are likely to vary from country to country. The European Union is probably furthest ahead in its thinking and has indicated a desire for all listed European insurers to report on the new standard by 2005. If this is to be the case then comparative figures would be required for 2004 which would mean that processes and systems would need to be in place by the start of 2004. Other jurisdictions are further behind in their thinking, but it seems that the principles of fair value accounting are beginning to be accepted in most major markets, including the USA and Japan.

Implications for Prudential Reporting

2.11 The purpose of the IASB project is to produce an international accounting standard for use in general purpose accounts. In parallel with the work being done by the IASB, a significant amount of effort is also being put into reviewing the system of reporting for prudential regulatory purposes. This is being driven forward on an international basis by the International Association of Insurance Supervisors ("IAIS") and at a domestic level by individual regulators.

2.12 In 1999 the Institute and Faculty of Actuaries established a working party to look into this issue from a UK perspective. The working party was given the following broad terms of reference:

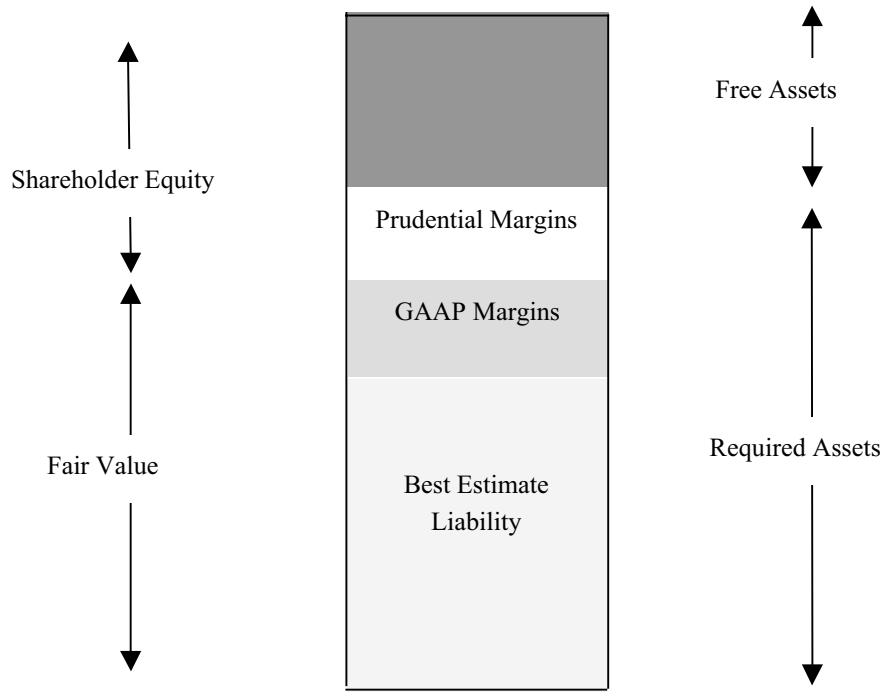
- To consider fair value in the context of the various objectives of actuarial valuations but to focus in particular on the prudential (i.e. statutory solvency) reporting requirements.
- To consider whether a better approach could be developed if no constraints, such as existing legislation, existed.
- To identify a set of fair value principles that can be applied for the purposes of prudential reporting and associated purposes.

2.13 The working party reported its findings in November 2001 (Fair Valuation of Liabilities – Report of the working party). In broad terms the working party accepted the merits of moving to a fair value based system and acknowledged the trend towards using a risk based capital approach for prudential reporting. It proposed the following six principles that should be applied to prudential reporting:

- For the purposes of prudential reporting, margins in excess of those appropriate for fair value in GAAP (i.e. general purpose) accounts are required.
- These excess margins should be disclosed to the users of financial statements so as to ensure transparency and comparability.
- The prudential reporting system should ensure that similar products sold by different legal entities receive similar accounting treatments.
- The prudential reporting system should encourage good risk management practice.
- The prudential reporting system should allow for the assets held by the insurer and the options available to policyholders.
- The prudential reporting system should have a set of trigger points above the point of genuine economic insolvency as a warning of capital tending to become insufficient.

2.14 It seems likely that the approach taken for prudential reporting will be closely related to that used for reporting in GAAP accounts but with an extra degree of prudence. Diagram 2.1 summarises the type of two tiered system that is likely to evolve.

Diagram 2.1: Prudential reporting in a fair value world



2.15 One of the most important additional margins for prudential purposes will be a margin for adverse deviations derived from the mismatching of assets and liabilities. A revised resilience test, perhaps based on a value at risk ("VaR") approach, will therefore need to be developed to reflect any inherent mismatching.

3 Theory of fair value calculations

3.1 This section sets out the key principles of fair value accounting for insurance contracts that we expect to be set out in the DSOP when it is complete. The application of fair value to different product classes is discussed further in Sections 7 to 9.

Asset and liability approach

3.2 In the case of GAAP statements several approaches to reporting profits are in use around the world. Broadly, these can be broken down into the following two types of method:

- deferral and matching approaches; and
- asset and liability measurement approaches.

3.3 Examples of deferral and matching approaches are US GAAP and Margins on Services (used primarily in Australia). The objective of a deferral and matching approach is to relate claim and expense costs to premium revenue. This generally has the effect of spreading profits over the lifetime of a contract as services are provided. In particular, acquisition costs are often deferred and amortised against future premium receipts.

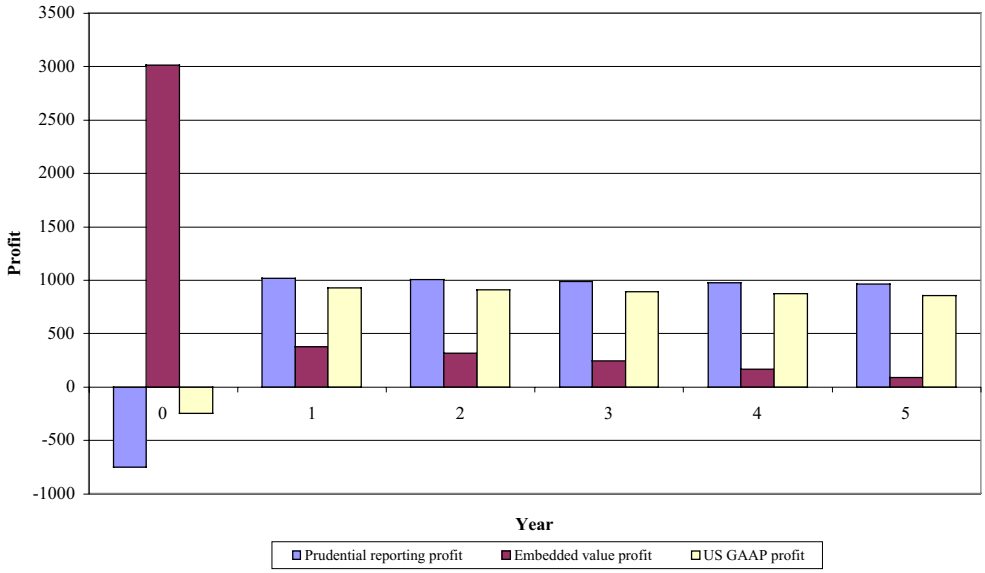
3.4 As the name would suggest, an asset and liability measurement approach is one that measures the assets and liabilities of an entity and recognises profit through the relative change in these two quantities from one year to the next. The embedded value method would be an example of such an approach.

3.5 The difference between these various approaches is illustrated in Graph 3.1 which shows how the emergence of profits differs for a unit-linked contract under US GAAP, embedded value and UK prudential reporting. Under each method the total profit is the same, but the incidence of the emergence of that profit is quite different.

3.6 The DSOP requires that an asset and liability approach be used. The reasons for this are as follows (essentially these refer back to the original objectives of the IASB project):

- an asset and liability approach will provide greater transparency;
- an asset and liability approach will produce accounts that are more understandable; and
- an asset and liability approach will make it easier for users to make comparisons between different sets of accounts.

Graph 3.1: Profit Signature for Unit-Linked Product



Entity-specific value vs Fair value

3.7 In section 1 we gave the International Accounting Standards definition of fair value. This definition refers to the amount that the enterprise would have to pay a third party at the balance sheet date to take over the liability.

3.8 The DSOP also offers an alternative to this "pure" definition of fair value, which it has named 'entity-specific-value'. Entity-specific value is defined as:

"the present value of the costs that the enterprise will incur in settling the liability with policyholders or other beneficiaries in accordance with its contractual terms over the life of the liability."

3.9 It is worth noting that the IASB Issues Paper contained no mention of entity-specific value and referred only to fair value. This approach was taken on the assumption that fair value would have replaced the current reporting standard (IAS39) for the majority of financial instruments well before it was implemented for insurance contracts. At the time this looked likely, but in practice the proposals to introduce fair value more generally have proved controversial and are now unlikely to proceed ahead of the insurance project.

3.10 As a result the final version of the DSOP refers to both entity-specific and fair value but concludes the following:

- while IAS39 is in place, assets and liabilities arising under insurance contracts should be measured at entity-specific value; but

- if a successor standard to IAS39 introduces full fair value accounting for the majority of financial assets and liabilities then the IASB should consider requiring fair value for insurance contracts.

3.11 It is important to appreciate that fair value and entity-specific value are not fundamentally different concepts. They are very similar in the majority of respects and differ only in one or two specific areas. The DSOP gives a useful example of where entity-specific and fair value may lead to different results. The example refers to the treatment of claim expenses and identifies the following two aspects that will affect their level:

- the insurer's strategy for determining the level of service provided to policyholders and its approach to claims management; and
- the insurer's efficiency in providing that level of service and implementing its approach to claims management.

3.12 Dealing with the first of these two points, the DSOP concludes that since the level of service and approach to claims management will impact on both the expense levels and lapse rates, both entity-specific and fair value should reflect the insurer's proposed approach in this area.

3.13 However, dealing with the second point, for a given level of service an insurer may be more or less efficient than the market and this should be reflected in the following way:

- entity-specific value should reflect the insurer's actual level of efficiency; and
- fair value should reflect the general level of efficiency in the market.

3.14 Although the comments we make in this paper are in the context of entity-specific value, we will assume that the terms entity-specific value and fair value are effectively interchangeable and for the remainder of this paper will only refer to the more commonly used fair value.

Prospective discounted cash flow approach

3.15 Fair value accounting will require a prospective approach to be taken. Cash flow items such as premiums, expenses and claims should be explicitly projected forward and discounted back to arrive at the value of liabilities.

3.16 The assumptions used to carry out these projections should be based on the company's expectation (i.e. the probability weighted average) of future experience. On the basis that the financial market's estimates will be more reliable than those of any individual company, market related assumptions (e.g. interest rates, inflation and asset prices) should be consistent with market data. Non-market related assumptions (e.g. lapse and expenses) should be determined by reference to factors such as historic information, the characteristics of the portfolio and industry data.

3.17 The starting point in the IASB proposal, before considering risk, is that cash flows should be discounted at the pre-tax risk-free rate of return. This rate should be based on:

- the current risk-free yield curve; and
- the currency of the cash flow.

Stochastic projections

3.18 Traditionally, prospective calculations have been carried out on a deterministic basis. However, according to the DSOP, the calculation of insurance liabilities should, at least in principle, be performed stochastically. A key argument in favour of using stochastic techniques is that they are generally more robust than deterministic methods in valuing embedded options. In addition, with a stochastic approach allowance can be made for more complex features, such as the interaction of various market and non-market related assumptions (e.g. between lapse rates and economic conditions).

3.19 While the DSOP states that in principle stochastic methods should be used, it does acknowledge that for many contracts such a complex approach may not be necessary since deterministic methods would give results that would fall within an acceptable range.

Allowance for non-market risk

3.20 The prospective calculation approach described above is based on expected non-market assumptions. In practice, investors are generally risk averse and attach greater weight to an adverse outcome than a favourable one. Because of this, market prices tend not to be driven purely by the expected values of outcomes, but rather by a risk-adjusted expected basis. This would suggest that some allowance should be made for risk in calculating the fair value of insurance liabilities.

3.21 The DSOP indicates that this allowance for risk can be made in either of the following ways:

- adjustment of the underlying cash flows; or
- adjustment of the rate used to discount cash flows.

3.22 So when valuing an insurance liability the risk preferences of investors should be allowed for either by increasing the liability cash flow or by reducing the discount rate. These adjustments for risk are often referred to as market value margins (MVMs) and although either of the above approaches is acceptable, there appears to be a preference for adjusting cash flows, on the basis that this is perhaps more transparent and easily understood.

3.23 When discussing risk the DSOP distinguishes between diversifiable and undiversifiable risk. Undiversifiable risks are those that tend to affect all investments.

For example, macroeconomic factors such as changes in interest rates, inflation or unemployment would tend to fall into this category. They are called undiversifiable risks since, their impact cannot be removed by exposure to a larger number of entities.

3.24 Diversifiable risks are those that relate to specific companies rather than the market as a whole. For example, the share price of an airline will be correlated to the price of aviation fuel. These risks can theoretically be diversified away by investing in different companies that are not subject to this particular risk.

3.25 While it is accepted that allowance should be made for undiversifiable risk, financial economic theory would indicate that no allowance should be made for diversifiable risk, indeed this is consistent with many commonly used asset pricing models such as the Capital Asset Pricing Model ("CAPM").

3.26 In contrast to this, the DSOP indicates that, for insurance liabilities, allowance should also be made for diversifiable risk. It believes that CAPM is based on idealised assumptions of highly efficient and liquid markets, which are not necessarily valid in less efficient markets such as that for insurance liabilities. This argument would seem to be borne out by market experience where, in reinsurance and securitisation deals, investors appear to demand a risk premium for taking on insurance related risks such as lapse or mortality risk that could, at least in theory, be diversified away.

3.27 While the DSOP indicates that allowance should be made for risk it does not answer the key question of what degree of allowance should be made, other than that it should be consistent with market risk preferences (i.e. the market price of risk). This is discussed further in the next section.

4 Some unresolved issues

4.1 Progress on developing fair value theory for insurance business has been rapid over the past year or two. There are however a number of issues that are yet to be resolved. This section discusses some of these outstanding issues.

Definition of insurance contracts

4.2 The IASB definition of an insurance contract is as follows:

"An insurance contract is a contract under which one party (the insurer) accepts an insurance risk by agreeing with another party (the policyholder) to compensate the policyholder or other beneficiary if a specified uncertain future event (the insured event) adversely affects the policyholder or other beneficiary (other than an event that is only a change in one or more of a specified interest rate, security price, commodity price, foreign exchange rate, index of prices or rates, a credit rating or event or similar variable)".

4.3 This definition draws out the important distinction between insurance risk and financial risk. Contracts, which currently have the legal form of insurance contracts, can have quite different levels of insurance and financial risk. At one end of the spectrum a non-linked term assurance product has significant insurance risk, through the level of life cover offered, but little financial risk. This product would clearly meet the IASB definition of an insurance contract. At the other end of the spectrum a UK-style regular premium unit-linked personal pension product has significant financial risk, but no obvious insurance risk. According to the IASB definition this type of product would not be an insurance contract.

4.4 Between these two extremes lie a multitude of other products. For example, unit-linked contracts with guaranteed death benefits have both financial and insurance risk and would probably be classed as insurance contracts. But how would single premium unit-linked bonds with a death benefit equal to 101% of the single premium be classed? Would this fairly minimal level of life cover meet the IASB requirements?

4.5 The DSOP sheds some light on this and states that:

"A contract creates sufficient insurance risk to qualify as an insurance contract if, and only if, there is a reasonable possibility that an event affecting the policyholder or other beneficiary will cause a significant change in the present value of the insurer's net cash flows arising from that contract."

The interpretation of "significant" is clearly the key to this statement.

4.6 This suggests a number of further questions. For example, one could envisage a situation where an insurance company has some of its products classified as insurance contracts, and reports for them under the insurance accounting standard, and others that do not meet the definition of insurance contracts and are therefore reported under a different accounting standard. Furthermore, if these two accounting standards differ

significantly then you could end up with comparable products having very different accounting treatments.

Allowance for future premiums

4.7 The issue of what allowance should be made for future premiums raises some interesting questions. Traditionally the approach taken to future premiums has been as follows:

- to allow for them where the benefit guarantees are dependent on future premiums being paid or if the default option is for premiums to be paid e.g. where premiums are collected by direct debit; and
- to allow for the probability of policies terminating or becoming paid-up.

4.8 Generally this approach would lead to future premiums being included for regular premium life policies and excluded for recurrent single premium life policies and non-life policies such as home and motor insurance.

4.9 The DSOP discusses the treatment of future premiums in some detail and concludes that future premiums should only be included to the extent that:

- their inclusion would increase the insurer's liability; or
- the option to renew is potentially valuable to the policyholder.

4.10 The DSOP goes on to define a renewal option as being potentially valuable in the following terms:

"A renewal option is potentially valuable if, and only if, there is a reasonable possibility that it will significantly constrain the insurer's ability to re-price the contract at rates that would apply for new policyholders who have similar characteristics to the holder of the option."

4.11 This would seem to suggest the following treatment of insurance contracts:

- inclusion of renewals on contracts where the premium rates are guaranteed but exclusion of renewals if premium rates are not guaranteed (or are subject to review in line with industry experience but without re-underwriting);
- inclusion of renewals on unit-linked contracts if the policy includes some form of potential guarantee (either in terms of restrictions to increases in future charges, investment guarantees or minimum death benefit) but exclusion of renewals if no such guarantees exist; and
- exclusion of renewals on annually renewable non-life contracts (e.g. motor insurance).

Adjustment for risk and uncertainty

4.12 As noted earlier, because investors are generally risk averse and attach greater weight to an adverse outcome than a favourable one, it is appropriate to allow for risk in fair value calculations. For this purpose it is helpful to split risk into the two categories of financial risk and non-financial risk.

4.13 Financial risk associated with the liability cash flow would normally be allowed for in a market consistent manner either via a replicating portfolio or through stochastic modelling and the use of a suitably calibrated asset model. It is worth noting that risks associated with the general mismatching of assets and liabilities are, on the whole, excluded from fair value calculations. For many contracts inclusion of this risk would be inconsistent with the general principle that fair value and entity-specific value should be independent of the type of assets held.

4.14 For insurance business, non-financial risks include demographic risk, expense risk, compliance risk and other operational risks. As noted in section 3, for non-financial risk the DSOP expresses a preference for including risk margins through adjustments to the cash flows rather than the discount rate. These adjustments will be determined by:

- the amount of risk; and
- the cost of the risk implied by market risk preferences.

4.15 In order to analyse this in more detail, the DSOP provides a breakdown of each area of risk between:

- model risk;
- parameter risk; and
- process risk.

4.16 Model risk is the risk that the entity has chosen an incorrect model of future cash flows. For example, the insurer may have assumed that certain future cash flows are normally distributed, when they actually follow a different distribution. It may also have ignored the risk of extreme events, such as future developments in medicine when considering longevity risk, or the possibility of default by a reinsurer.

4.17 Parameter risk is the risk that arises because, although the structure of the model may be a reasonable one, the parameters used have to be estimated and these estimates may be wrong. This can result in mis-estimation of the current quantum of the risk and/or future trends in the quantum of the risk.

4.18 Process risk refers to random statistical fluctuations that will occur even if the model turns out to have perfectly predicted the underlying claims experience. While this type of risk may be significant for small populations it will generally reduce as portfolio size increases.

4.19 While such a breakdown is useful, no consideration is given in the DSOP to the practicalities of quantifying each of these risks. Little research in this area has yet been published, although Van Broekhoven (2001) has suggested an approach to estimate parameter risk.

4.20 It seems that a substantial amount of analysis of past data, probability distributions, future trends and extreme events is required to come up with a sound statistical basis for quantifying risk. Whilst data may be available on mortality and expense risk, for other non-financial risks such as compliance and operational risk the task may be very difficult given the lack of credible data in these areas.

4.21 Another area of research needs to focus on determining the market's risk preferences for these risks. Further analysis of this is beyond the scope of this paper, but it is clear that a substantial amount of work remains to be done in this area before fair value is implemented, if a consistent approach is to be established across the industry.

4.22 Daly (2001) suggests a method of calculating risk margins for non-financial risk by comparison with financial risk. His approach expresses the cost of risk as a multiple of the volatility of the risk. For example suppose that the risk premium for investing in equities is 3.0% per annum and equity volatility (i.e. the standard deviation of annualised equity returns) is around 20%. The risk premium required to invest in equities is then 15% of the standard deviation of the return.

4.23 It could be argued that the risk premium for non-financial risk should be greater since the equity market is deep and liquid and equity risk premiums will therefore be bid down to a low level. One could therefore assume, for example, that the risk premium for an insurance risk is 25% of the standard deviation of that risk.

4.24 If we then knew the standard deviation of a particular item (for example the surrender rate) was 40%, then using a risk premium assumption of 25% of a standard deviation would lead to a risk premium of 10%. As a result, assuming that a high surrender rate was prudent, the fair value surrender rate would be set to 110% of its expected level.

4.25 While providing a theoretical framework in practice this approach presents many challenges:

- the risk premium on equities is not known (a historic value could perhaps be used as an approximation, but over what period?);
- the standard deviation of equity returns is not known (although implied volatility is);
- the extra risk margin for non-financial risks is subjective; and
- the standard deviation of surrender experience and other non-market risks is not known (historic data may not be credible or particularly relevant).

4.26 In many cases the fair value assumptions will be considered in the context of the prudential statutory valuation and embedded value assumptions. The latter would generally be regarded as best estimate (or expected) assumptions and should not contain significant margins of prudence. The former would generally be regarded as conservative estimates. It may therefore be reasonable to assume that the risk-adjusted fair value assumptions should fall somewhere between these two measures.

4.27 What is clear is that many companies will be looking for guidance in this area. The UK Faculty and Institute working party suggested that an Actuarial Standards Board ("ASB") should be established to provide guidance on this topic. In any event a set of agreed standards, even if these were highly subjective, would seem to be helpful and would ensure greater consistency across the industry.

Risk-free rate of return

4.28 The DSOP states that the starting point for determining the discount rate for insurance assets and liabilities should be the pre-tax market yield at the balance sheet date on risk-free assets. The definition of risk-free assets are those with readily observable market prices whose cash flows are least variable for a given maturity and currency.

4.29 Although it stops short of prescribing exactly how the risk-free rate should be derived, the DSOP does provide the following guidance:

- No assets provide certain cash flows but central government bonds will often provide the most certain cash flows for a given maturity and currency.
- If there is no active market in government securities then yields on other high quality securities, adjusted for the risk of default and excluding risk premiums for bearing the risk of variations in returns, should be used.

4.30 The DSOP would therefore seem to suggest that, if there is no active government bond market, then the risk-free rate of discount should be based on corporate bond rates adjusted for risk of default. It has been argued that, based on historic default rates, the risk-adjusted yield on corporate bonds exceeds that of government securities and that this remaining yield reflects a liquidity premium which can be retained in the fair value calculation. The authors would disagree with this since the adjustment for default risk must not only allow for the best estimate loss due to defaults but also for the investors' risk aversion. Market consistent pricing would imply that all of the excess yield should be removed. Inclusion of any liquidity premium would also seem to go against the principle of comparability and comments made elsewhere in the DSOP that illiquidity and other market inefficiencies should be excluded from fair value calculations.

4.31 While in our view liquidity premiums should not be included in fair value calculations, it is worth noting that in many cases this represents a change from past practice in calculating embedded values and in prudential reporting,

Tax

4.32 The DSOP proposes that insurance assets and liabilities should be measured by discounting pre-tax cash flows at a pre-tax discount rate. The reason given for this is that a separate accounting standard (IAS 12) deals with how entities account for tax. It would therefore seem that tax should be excluded from fair value calculations.

4.33 In defining the cash flows that should be included and excluded from fair value calculations, the DSOP states that:

- income tax payments and receipts should be excluded from the calculation; but
- transaction based taxes and levies should be included.

4.34 The DSOP goes on to describe income taxes as being those based on taxable profits and transaction taxes as being items such as premium taxes and value added taxes as well as policyholder taxes deducted by the insurer on behalf of the tax authorities. This suggests that in the UK it will be necessary to split out policyholder and shareholder taxes and to include the former but not the latter in fair value calculations.

4.35 It would seem that at some stage the following tax-related questions will need to be addressed:

- If policyholder tax depends on the assets held then will it be necessary to take account of these assets in fair value calculations?
- On what basis will the UK authorities choose to tax insurance business; will it be on the basis of prudential reporting or fair value profits?

5 Fair value vs Embedded value

5.1 In the UK, many companies currently report on an embedded value basis. In this section we will examine how the approach taken under fair value differs from traditional embedded value techniques. Later in sections 7 to 9 we will compare the results obtained from fair value calculations with those produced using embedded value techniques.

Cost of capital adjustments

5.2 Traditional embedded value techniques generally make an allowance for the cost of regulatory capital. To the extent that capital required by the regulators, in the form of statutory reserves and solvency margin, is assumed to earn a net rate of return below the risk discount rate there will be a related cost.

5.3 In contrast to this, cost of capital adjustments are not permitted under the current DSOP. The rationale behind this is that, although regulatory capital is necessary to ensure that the insurer is able to meet its contractual obligations with a high degree of certainty, the requirement to hold prudent reserves does not actually impact on the future policy related cash flows and hence the expected liabilities of the insurer in any direct way.

5.4 While one can see the rationale of this approach, it does seem to go somewhat against the prices actually paid for insurance companies in merger and acquisition deals where the purchaser generally does take the cost of regulatory capital into account.

Independence from assets held and exclusion of investment income

5.5 The approach taken in a traditional embedded value calculation is to allocate assets to a block of insurance liabilities and to project the returns on these assets forward. Typically, equities will be assumed to earn a higher rate of return than the risk-free rate. As a result, increased investment in equities will generally result in an increase in embedded value unless the higher investment return is compensated for in the choice of risk discount rate.

5.6 Under fair value accounting assets are taken into the calculation at market value and liability cash flows are projected forward and then discounted back to obtain the fair value of the insurance liabilities. In general, the discount rate does not depend on the assets held and nor, therefore does the fair value.

5.7 There are two important exceptions to the general approach described in the previous paragraph. First for with-profit business future bonus declarations will depend on the return on the assets held. For this class of business a projection of the return on the assets held is therefore required in order to determine what bonuses are declared and ultimately what policyholder liabilities will be paid. Second, for unit-linked business the policyholder benefits are clearly linked to the performance of the assets held. Despite this, as we will demonstrate in section 8, a projection of the assets is generally not required for unit-linked business unless the product contains some sort of

investment guarantee. In this case the value of the guarantee will depend on the volatility of the assets held and stochastic projections are required.

Fair value vs Embedded value

5.8 During the consultation period following the publication of the Issues Paper, certain parties argued for embedded value techniques to be adopted as the basis for fair value calculations. The main argument in favour of taking this approach was that embedded value methods are tried and tested and there is a substantial amount of experience and expertise in their use. In addition transfers of books of insurance business often occur on a basis similar to that assumed in embedded value calculations.

5.9 A summary of the differences in embedded value and fair value approaches is set out in Table 5.1.

Table 5.1: Comparison of fair value and embedded value methodology

	Embedded value	**Fair value**
Methodology	Deterministic	Stochastic or deterministic
Assumptions	Expected value	Risk-adjusted
Discount rate	Risk-adjusted	Risk-free
Return on assets	Included in projections of future surplus	Not included in projections of cash flow unless impacts on policyholder benefits
Options	Allowance based on intrinsic value on EV assumptions, potentially also some allowance in discount rate	Direct allowance (market consistent stochastic modelling/price of hedging asset)
Cost of capital	Direct allowance	No allowance
Value of liabilities	Obtained indirectly as the prudential reserves less the value of in-force	Obtained directly as the discounted value of cash flows

5.10 Although there are similarities between the two approaches it is worth noting that the DSOP does not permit embedded value methods for the following stated reasons:

- Embedded value techniques do not necessarily place a market consistent value on the assets held by an insurer.
- Embedded value calculations usually reflect the cost of holding regulatory capital within the insurance company. As we saw in section 5.3 this is not permitted under the DSOP.

6 Introductory examples

6.1 In section 3 we discussed the theory behind the calculation of the fair value of insurance liabilities. In particular, we touched upon the fact that, while in principle stochastic methods should be used, in practice it should also be possible to employ deterministic methods for the more straightforward products. In this section we will briefly discuss and provide examples of these two approaches.

Deterministic Methods

6.2 Deterministic methods would typically be used for contracts that have either no financial guarantees or only financial guarantees that are traded in the markets. A deterministic method appropriate to such contracts is the replicating portfolio method for which the following approach is taken:

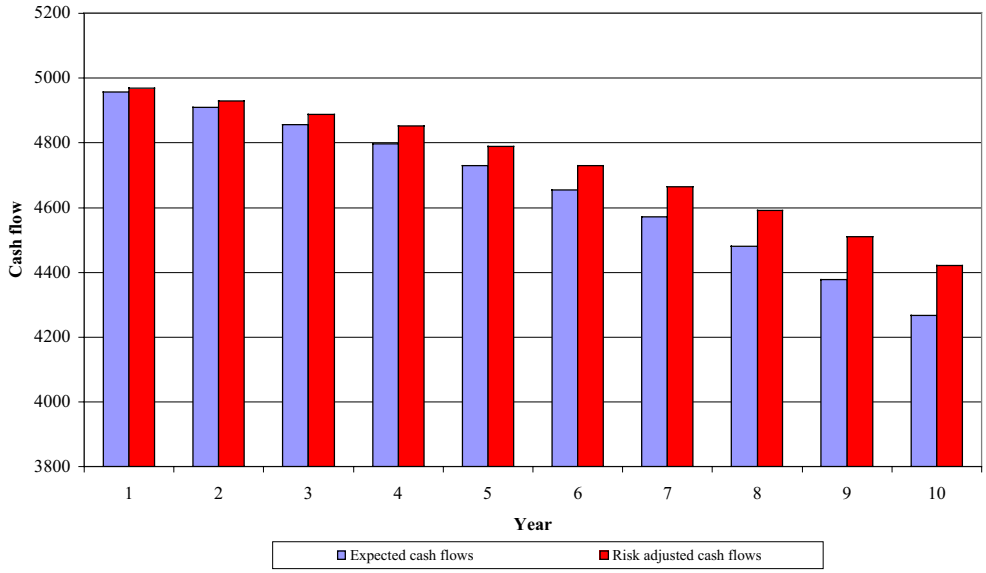
- non-market related assumptions, based on expected levels, are chosen and are adjusted for risk;
- liability cash flows are projected forward on these assumptions;
- traded assets are found that have cash flows that exactly match the risk-adjusted liability cash flows; and
- the fair value of the liability is taken as the market value of the traded assets.

6.3 It is important to appreciate that it does not matter whether or not the insurer holds the replicating portfolio; the portfolio simply serves the purpose of determining the fair value of the liabilities. If the insurer were to hold the replicating portfolio it would be perfectly matched, assuming of course that the non-market related assumptions were borne out in practice. This technique is illustrated in the following paragraphs using two simple examples.

Example 1: Non-linked annuity

6.4 An in-force conventional non-linked annuity could be modelled by projecting the liabilities and would typically have the cash flow profile shown in Graph 6.1 before and after adjusting for risk. For illustrative purposes we have only shown cash flows for the first ten years.

Graph 6.1: Liability cash flows for non-linked annuity



6.5 The replicating portfolio for this policy would be a series of risk-free (i.e. government issued) zero coupon bonds precisely matching the liability outflow in each year. The fair value of the liabilities would then be the sum of the market values of these matching zero coupon bonds. So, if we assume a risk-free rate of 5% per annum, a flat yield curve and that all cash flows are year end, this would lead to the fair value calculation set out in Table 6.1

Table 6.1: Replicating portfolio for non-linked annuity

Year	Expected cash flow	Adjustment for risk	Risk adjusted cash flow	Investment	Market value of investment
1	4,957	10	4,967	1 year zero	4,730
2	4,909	20	4,929	2 year zero	4,471
3	4,856	31	4,887	3 year zero	4,222
4	4,796	55	4,851	4 year zero	3,991
5	4,729	59	4,788	5 year zero	3,752
6	4,654	75	4,729	6 year zero	3,529
7	4,571	93	4,664	7 year zero	3,315
8	4,479	112	4,591	8 year zero	3,107
9	4,378	132	4,510	9 year zero	2,907
10	4,267	154	4,421	10 year zero	2,714
Total	**46,596**	**741**	**47,337**		**36,737**

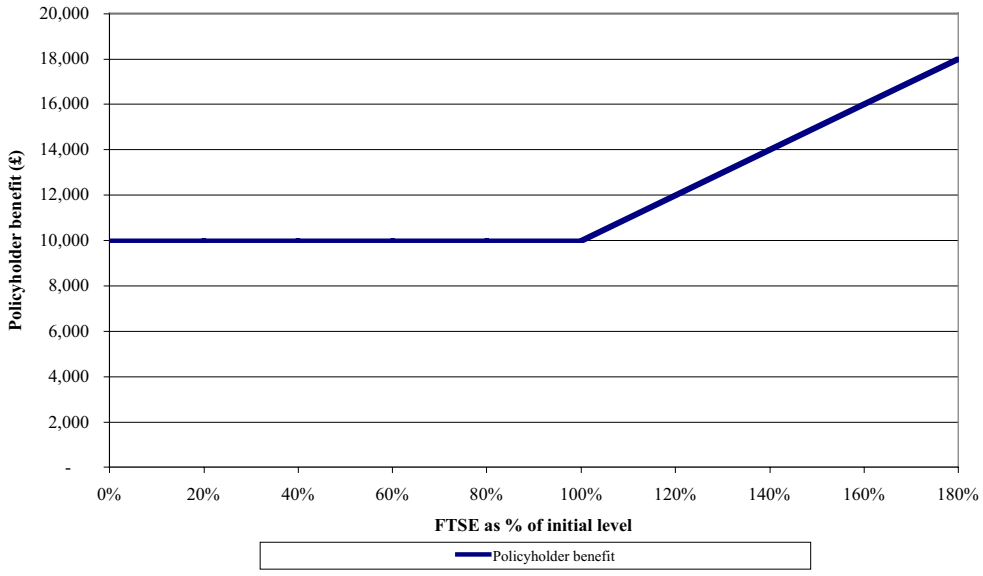
6.6 The total market value of the replicating portfolio of 36,737 represents the fair value of the liability. In this example we have only modelled the annuity cash flows. In practice, this product would also have related expense cash flows which, assuming

they were linked to RPI, could be valued by discounting the linked cash flows (assuming zero inflation) at the risk free index linked yields.

Example 2: Index-Linked Guaranteed Equity Bond

6.7 The previous example showed how a replicating portfolio could be used to value a fixed stream of insurance liabilities. We will now go one stage further and examine how a replicating portfolio can be used to value a product with a simple investment guarantee. The product in question is an index-linked single premium guaranteed equity bond. The benefit at the end of the five year term is a return of the initial investment plus any increase in the level of the FTSE 100 index over the period. The payoff profile for an initial £10,000 investment would be as shown in Graph 6.2:

Graph 6.2: Guaranteed Equity Bond Payoff Profile



6.8 A replicating portfolio for this liability can be constructed as a combination of:

- a zero coupon bond providing the guaranteed return of the initial investment on maturity; and
- a purchased call option, which on maturity of the bond, gives the insurer the option to buy the FTSE 100 index at the level at which it stood at policy inception.

6.9 Prices for both of the above assets can be obtained from the market. The market value of the zero coupon bond could be obtained very simply and, assuming it was risk-free, no further adjustment for risk would be required. The price of the call option could be obtained from an investment bank but, since this would not be a risk-free price, an adjustment for risk would be required. It is worth noting that if this product had been property-linked rather than index-linked the policyholder would have borne the default risk and an adjustment for this risk would not therefore be required. In addition as

explained earlier it would be necessary to value any other liability cash flows associated with the product such as expenses.

Stochastic methods

6.10 In cases where the liability cash flow is too complex to be able to determine the replicating portfolio, stochastic methods would generally need to be employed. This would typically be the case for contracts with complex guarantees (e.g. with-profit business). At present the most commonly discussed stochastic method is the state price deflator method. A description of the theory of deflators can be found in Jarvis, Southall and Varnell (2001).

6.11 In very broad terms deflators can best be described as stochastic discount rates and can be used to calculate the fair value of liabilities in the following manner:

- a stochastic asset model is run, the output from which will include a deflator for each time period of each scenario;
- the liability cash flows are projected and are adjusted for non-financial risk;
- for each simulation the deflator is applied to the relevant cash flow at each point in time and these values are summed across all projection steps to obtain a deflated value; and
- the fair value of the liability is the mean value of the deflated cash flows.

6.12 The projected returns and deflators are calibrated to market prices of various traded investments. The model will be market consistent in the sense that if it is used to value the cash flow associated with the market instruments to which it has been calibrated it will (broadly) reproduce the market price. In practice differences can arise due to simulation error and the fact that the calibration may have been a best fit to a large number of market prices rather than a perfect fit to a few.

Example 3: Non-linked annuity

6.13 The use of the state price deflator method to value complex unit-linked and with-profit contracts is discussed in sections 8 and 9. As a simple example, to demonstrate the fact that state price deflators can be used on simple as well as complex products, Table 6.2 is a repeat of Example 1 but using the state price deflator method with five simulations.

Table 6.2: Use of state price deflators for a non-linked annuity

		Deflators				
Year	**Risk-adjusted cash flow**	**Run 1**	**Run 2**	**Run 3**	**Run 4**	**Run 5**
1	4,967	0.9867	0.9124	0.8993	1.0011	0.9433
2	4,929	0.8613	0.9410	0.8248	0.9826	0.9468
3	4,887	0.8022	0.9097	0.7677	0.9504	0.9470
4	4,851	0.8126	0.8085	0.7423	0.8850	0.8527
5	4,788	0.7215	0.8197	0.6831	0.8658	0.8534
6	4,729	0.6579	0.8094	0.6663	0.7991	0.7864
7	4,664	0.6279	0.7635	0.6288	0.7623	0.7493
8	4,591	0.6347	0.6799	0.5552	0.7773	0.7299
9	4,510	0.5854	0.6637	0.5506	0.7057	0.6700
10	4,421	0.5007	0.6986	0.5236	0.6680	0.6824
Deflated value		**34,270**	**38,054**	**32,587**	**39,938**	**38,806**

6.14 The deflators have been output from an asset model and have been used to value the risk-adjusted cash flows. The deflated value is the sum of the products of the deflators and cash flows for each run. The average over the above five runs equals £36,731 compared to £36,737 using the deterministic method in paragraph 6.5. This difference reflects the random statistical error resulting from such a small number of simulations. Table 6.3 demonstrates how the results converge to that arising from the deterministic run as the number of stochastic simulations increases. This convergence only happens if the stochastic asset model is correctly calibrated.

Table 6.3: Fair value liability for increasing number of simulations

Number of simulations	**Fair value**
100	36,755
500	36,744
1000	36,733
5000	36,739
Deterministic	36,737

7 Illustrative examples: non-profit business

7.1 In this section of the paper we look at two simple non-profit contracts, a pension term assurance and a pension annuity, and carry out :

- a comparison of the initial liability and pattern of profits emerging on a fair value basis (excluding non-market risk adjustments) with those on an embedded value and prudential reporting basis; and
- an illustration of the effect of introducing the derived risk adjustments into the fair value calculations.

Pension term assurance

7.2 The product we have modelled is an individual policy, assumed to be part of a large portfolio, with an original term of 20 years and an outstanding term 10 years. The assumptions are set out in detail in Appendix A. Initially the assumptions are intended to be expected values and include no allowance for risk. In summary, the product parameters are as follows:

- the premium is £180 per annum payable for the policy term of 20 years;
- the sum assured is £50,000;
- policyholder is a male aged 40 at entry for whom we have assumed aggregate smoker/non-smoker mortality; and
- cash flow items are premiums less claim payments and expenses (note that investment income is not included in the cash flows).

Base Case

7.3 Using the above assumptions, Table 7.1 provides the following information on prudential reporting, embedded value and fair value (excluding non-market risk adjustments) bases:

- the value of insurance liabilities at the start of the projection (the "embedded value liability" is defined as the prudential reserves less the value of in-force business); and
- the profits that are projected to emerge assuming the embedded value assumptions are borne out.

Table 7.1: Comparison of liability and profit for term assurance product (£)

	Prudential reporting	Embedded Value	Fair value
Liability	**(605)**	**(84)**	**(32)**
1	95	42	32
2	92	37	29
3	88	33	25
4	84	29	22
5	80	24	19
6	74	20	15
7	68	15	12
8	62	11	9
9	54	7	6
10	46	3	3
Total	**139**	**139**	**139**

Commentary on results

7.4 To ensure that we have comparable results under all three methods, we have assumed that the assets held by the insurer equal the initial prudential liabilities under all three methods. This avoids differences in the projected investment returns included in the profit figures.

7.5 Naturally, the initial liability under prudential reporting is greater than under the other two methods reflecting the additional margins of prudence. This leads to higher profits in the subsequent years as these margins are released over the outstanding policy term. However, the sum of the profits released and the initial liability is the same under all three methods.

7.6 The embedded value figure includes an allowance for risk (via the risk discount rate used) and the initial liability is therefore greater than the fair value but lower than the prudential liability. We are assuming that the embedded value assumptions are borne out in practice and hence profits in years 1 to 10 are simply equal to the unwinding of the risk discount rate on the value of in-force business at the start of the year. For example at the start of the projection period the value of in-force business would be £521 (605 – 84) and the unwinding of the risk discount rate on this would be £42 (521 x 8%) which equals the first year profit.

7.7 In this example the fair value calculation includes no allowance for risk and the initial liability is therefore lower than the embedded value liability. Subsequent profits represent the return on the assets held in excess of the fair value liability plus the additional return above the risk-free rate, on the assets backing the fair value liability. For example, in the first year we are holding assets of £605 and the fair value of liabilities is £32. We therefore have excess assets of £573 and will earn interest on these assets of £31.51 (573 x 5.5%). In addition the assets backing the fair value

liability yield 0.5% above risk-free which will give rise to a profit of £0.16 (32 x 0.5%) on the fair value liability. This gives a total profit in the first year of £31.67.

Allowance for non-market risk

7.8 We now turn to the question of what margins need to be built into the expected assumptions in order to allow for risk. In section 4 we discussed the practical approaches that can be taken. The approach described in paragraphs 4.22 to 4.25 relies on the ability to accurately estimate the statistical distribution of the assumption. In practice, at least initially, it seems unlikely that there will be enough credible information available to be able to make these sorts of assessments.

7.9 While recognising its subjectivity, as a practical way forward, the approach we propose to take in this paper is that set out in paragraph 4.26 i.e. to assess the risk-adjusted fair value assumptions by reference to the embedded value and prudential reporting assumptions.

7.10 For a term assurance product mortality will be a key assumption. The factors that would need to be considered when assessing an appropriate mortality risk margin would include the following:

- uncertainty about current expected and future trends in the level of mortality;
- uncertainty about the incidence of one-off events either increasing or decreasing mortality (e.g. medical developments); and
- random statistical variations (e.g. in the number of deaths or the size of claims) that will occur even if the model has perfectly predicted the underlying claims experience.

7.11 Expense risk will also be important for term assurance business. This can be broken down into two key components. First there is uncertainty about the initial level of expenses. The starting point here would be the expense budget of the entity in question. The DSOP states that an entity-specific valuation should allow for information not in the public domain (although how feasible this will be in practice remains to be seen). Risk margins should be included to cover factors such as the possibility that planned efficiency gains are not achieved or to allow for unforeseen events that may increase the level of expenses above that projected in the budget.

7.12 The second component of expense risk is uncertainty about the rate of increase in the underlying index of expenses. This could also be viewed as inflation risk and, if the rate of increase in expenses were linked to RPI (as may be the case for third party administration expenses), this risk could be hedged by the purchase of suitable index-linked government bonds. In practice the expenses of an insurer are generally a mixture of those related to RPI and AEI and should therefore increase at a rate somewhere between these two measures. Given that RPI risk can be hedged, we only need to consider variations in the rate of increase of expenses above RPI. This could arise from a number of factors such as unforeseen wage escalation or lower than expected new business resulting in higher per policy expenses.

7.13 The final component of risk that needs to be allowed for relates to lapse risk. This is perhaps the assumption for which we have the greatest amount of uncertainty due to the lack of credible information (at least relative to mortality) and because of the number of factors that can influence the decision to lapse a policy. As a starting point we would need to consider all of the factors set out in paragraph 7.10. However, in addition consideration should also be given to other factors. For example, whether a high or low lapse assumption is conservative (e.g. for a term assurance product high lapses will generally be conservative initially but low lapses will be conservative in later years) or for any correlation of lapse rates with economic conditions.

7.14 Table 7.2 summarises the expected and risk-adjusted fair value assumptions.

Table 7.2: Expected and risk-adjusted assumptions for term assurance product

	Expected assumptions	**Risk-adjusted fair value assumptions**
Mortality	80.0% TM92	82.5% TM92
Expenses	£20.00 p.a.	£21.00 p.a.
Inflation	RPI plus 1.5% p.a.	RPI plus 1.75% p.a.
Lapses	5.00% p.a.	3.75% p.a.

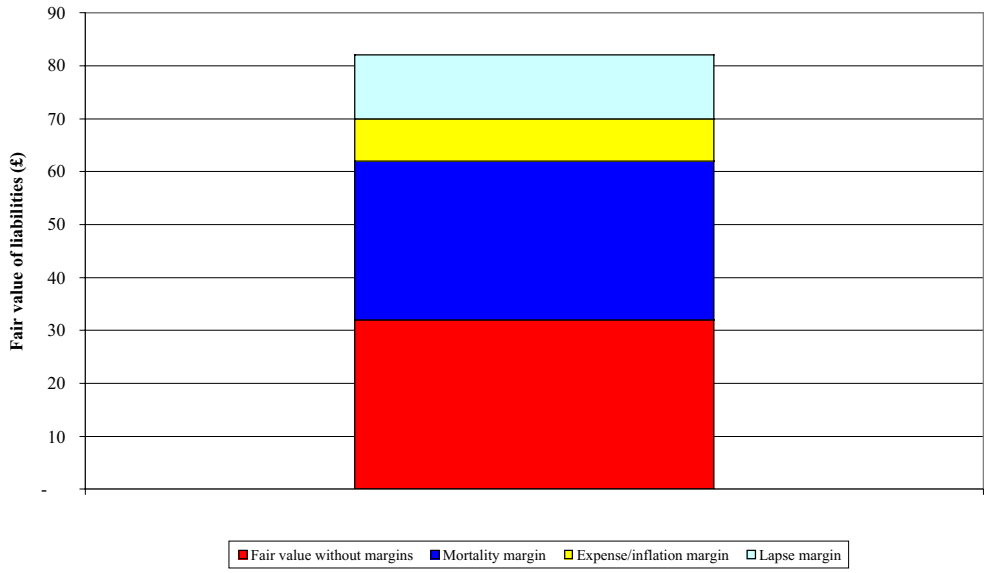
7.15 Using these risk adjustments Table 7.3 sets out the revised fair value liability and profit figures relative to the embedded value, prudential reporting and fair value (excluding non-market risk margins) results.

Table 7.3: Impact of introducing risk margins for term assurance product (£)

	Prudential reporting	**Embedded Value**	**Fair value**	
			Unadjusted	**Risk-adjusted**
Liability	**(605)**	**(84)**	**(32)**	**(82)**
1	95	42	32	34
2	92	37	29	31
3	88	33	25	29
4	84	29	22	27
5	80	24	19	24
6	74	20	15	21
7	68	15	12	18
8	62	11	9	15
9	54	7	6	12
10	46	3	3	9
Total	**139**	**139**	**139**	**139**

7.16 The figures in the first three columns are unchanged from those in Table 7.1. The introduction of risk margins into the fair value calculation increases the initial liability from £32 to £82. Graph 7.1 analyses the change in the fair value of the liabilities at the start of the projection period resulting from the introduction of each of the risk adjustments in turn.

Graph 7.1: Impact of introducing risk margins on fair value of liabilities



7.17 As one might expect, the mortality risk margin has the greatest impact and increases the fair value of liabilities from £32 to £62. Introducing the expense/inflation and lapse risk margins increases this to £70 and £82 respectively.

7.18 Clearly it is possible to derive the embedded value risk discount rate that would be required to equate the embedded value liability to the fair value liability. With no allowance for risk, a risk discount rate of around 5.7% would equate the embedded value liability to the fair value liability. This increases to 7.9% once the risk margins are included.

Pension annuity product

7.19 The second example is a pension annuity product at the point of sale. The assumptions we have used are set out in detail in Appendix A. In summary the product parameters are as follows:

- the initial single premium is £30,000;
- the annuity payable is £2,500 per annum;
- the policyholder is a male aged 65 at entry; and
- cash flow items are annuity payments and expenses.

Base Case

7.20 The results are set out in Table 7.4. At this stage the fair value figures exclude any allowance for non-market risk.

Table 7.4: Comparison of liability and profit for pension annuity (£)

	Prudential reporting	Embedded value	Fair value
Liability	**(30,196)**	**(28,421)**	**(29,258)**
1	185	142	198
2	182	139	193
3	180	135	189
4	178	131	184
5	176	128	178
6	174	124	173
7	172	120	167
8	170	116	161
9	167	111	154
10+	2,586	1,250	1,635
Total	**(26,026)**	**(26,026)**	**(26,026)**

Commentary on results

7.21 To simplify the comparison of results between the three methods we have again assumed the same level of backing assets in each case. In addition, for this product the figures in the final row of the above table represent the profits emerging in year 10 and beyond.

7.22 As for the term assurance product under prudential reporting, the initial liability is greater than under the other two methods. This reflects the additional level of prudence inherent in this calculation.

7.23 In the term assurance example, the liability recognised under fair value was lower than under the embedded value method. By contrast, in this case the fair value liability lies between the embedded value and prudential reporting figures.

7.24 The reason for this is that in the embedded value calculation we are capitalising the differential between the yield on the assets held (5.5%) and the yield on risk-free assets (5.0%). This is normal practice in embedded value calculations. However, in calculating the fair value of liabilities a risk-free rate of return is assumed which gives rise to a correspondingly higher liability. This point was discussed in paragraphs 4.28 to 4.31.

7.25 As in the term assurance example fair value profits represent the return on the assets held in excess of the fair value liability plus the additional return above the risk-free rate, on the assets backing the fair value liability. Also, since we are assuming that the embedded value assumptions are borne out in practice, embedded value profits represent the unwinding of the risk discount rate on the value of in-force business at the start of the year.

7.26 Given that this is a new policy, it is interesting to examine the profit recognised at inception under each reporting method. The premium paid was £30,000 and initial expenses were £100 fixed plus 1.5% of the premium i.e. £550 in total. This leads to a profit of £1,029 (30,000 – 550 – 28,421) embedded value reporting. In contrast, under fair value and prudential reporting losses of £746 and £192 respectively are made at inception.

Allowance for non-market risk

7.27 The approach we will take to allow for risk will be similar to that taken in the term assurance example. In fair value calculations, for an annuity product the most important risk factor will be the mortality assumption. However, in contrast to the term assurance product we are now concerned about reductions rather than increases in mortality.

7.28 Despite the fact that historically mortality rates for the annuitant age group have been more stable than for the assured lives age group, at the current time there is generally more concern about reductions rather than increases in future mortality. This is witnessed by the general reluctance of reinsurers to take on significant longevity risk and also the recent strengthening of prudential reporting assumptions for annuity business.

7.29 As well as mortality we also need to allow for expense and inflation risk. The risks here are very similar to the term assurance product (although possibly over a longer period) and we will therefore make the same adjustment for risk.

7.30 Table 7.5 summarises the expected and risk-adjusted fair value assumptions.

Table 7.5: Expected and risk-adjusted assumptions for pension annuity product

	Expected assumptions	**Risk-adjusted fair value assumptions**
Mortality	90.0% PMA92	87.5% PMA92
Expenses	£20.00 p.a.	£21.00 p.a.
Inflation	RPI plus 1.5% p.a.	RPI plus 1.75% p.a.

7.31 Using these risk adjustments, Table 7.6 sets out the revised fair value figures relative to the embedded value, prudential reporting and fair value (excluding non-market risk margins) results.

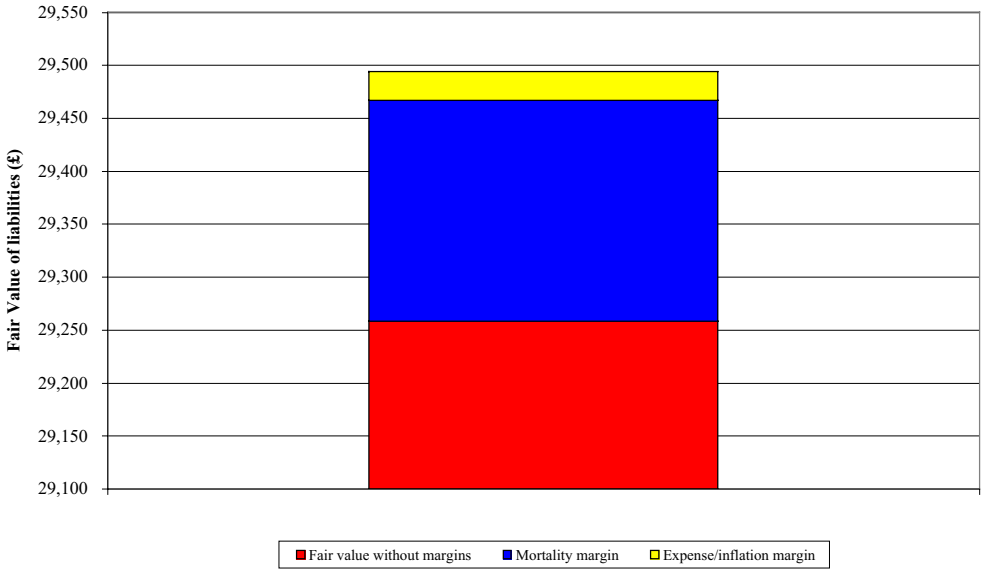
Table 7.6: Impact of introducing risk margins for pension annuity (£)

	Prudential Reporting	**Embedded value**	**Fair value**	
			Unadjusted	**Risk-adjusted**
Liability	**(30,196)**	**(28,421)**	**(29,258)**	**(29,494)**
1	185	142	198	194
2	182	139	193	190
3	180	135	189	186
4	178	131	184	182
5	176	128	178	178
6	174	124	173	173
7	172	120	167	168
8	170	116	161	163
9	167	111	154	157
10+	2,586	1,250	1,635	1,876
Total	**(26,026)**	**(26,026)**	**(26,026)**	**(26,026)**

Commentary on results

7.32 The introduction of risk margins into the fair value calculation increases the liability from £29,258 to £29,494. Graph 7.2 analyses the change in the fair value of the liabilities at the start of the projection period resulting from the introduction of each of the risk adjustments in turn.

Graph 7.2: Impact of introducing risk margins on fair value of liabilities



7.33 Again as you would expect the mortality risk margin is the most important for this product and increases the liability from £29,258 to £29,467. The expense and inflation risk margins are relatively unimportant for this product.

8 Illustrative example: unit-linked business

8.1 In this section we will look at how fair value could be applied to unit-linked business. In particular we will:

- discuss the different approach required for unit-linked business compared to that taken in the previous section for non-linked business;
- compare the initial liability and pattern of profit emerging on a fair value basis (with no risk adjustments) with that on an embedded value and prudential reporting basis;
- examine the effect of introducing risk adjustments into the fair value calculations; and
- discuss the effect of introducing an investment guarantee into the product.

8.2 Before delving into the detail of the calculation, it is first worth reiterating that the DSOP recognises that for unit-linked and with-profit business the benefits paid to policyholders are directly linked to the performance of the assets held. The DSOP refers to unit-linked business as an "extreme" case of with-profit business in which the split between policyholder and shareholder benefits is in the ratio 100/0 and there is no smoothing of policyholder returns.

8.3 In practice, the cash flows for a unit-linked product fall into two categories: those that are related to the unit fund (e.g. unit related benefits and charges) and those that are not (e.g. expenses and premium related charges). We will demonstrate that the latter are essentially no different to the cash flows that arise under conventional non-profit policies and can therefore be valued in a similar way i.e. by adjusting for risk and discounting at the risk-free rate of return. In contrast, cash flows that relate to the unit fund need to be treated differently. To consider this in more detail we will look at a simple example.

A simple unit-linked example

8.4 In the DSOP, for unit-linked business, liabilities are defined as follows:

- the initial unit fund;
- less the fair value of any estimated future charges applied to the initial unit fund;
- plus the fair value of future maintenance expenses;
- less the fair value of future charges arising from future premium receipts;
- plus the fair value of any guarantee of investment performance (applicable on maturity, surrender or lapse), determined using an option pricing model.

8.5 This approach effectively analyses the sources of surplus to the insurer. In particular it should be noted that it is not necessary to project forward benefit payments made to policyholders. Although one could arrive at the same result by projecting policyholder benefits and discounting back at an appropriate rate, this would not be a

straightforward exercise. As we demonstrate below, if this approach were taken then the appropriate discount rate would be a combination of the unit growth and risk-free rates of return and would not be easy to determine.

8.6 Consider a one year policy with a unit fund of £1,000, no future premiums, charges, expenses or tax and no decrements prior to maturity. The fair value of the policyholder liability can be obtained by projecting forward the policyholder benefits and discounting back to the valuation date. Given that the only stakeholder in this transaction is the policyholder, the value of the policyholder liability must equal the value of the assets. For this to be the case the rate of discount used must equal the unit growth rate. The value of assets less liabilities equals the shareholders' interest in the policy and is, as you would expect, zero in this case. If this were not true then we would have created a spurious profit or loss for the insurer.

8.7 If we now consider the same policy but with a management charge of 1% of funds under management at the end of the first year. We now have two stakeholders, the policyholder and the insurer. Assuming unit growth of 10% per annum the policyholder liability is £1,089 and the shareholder interest is £11 at the end of the year which, discounted back at the unit growth rate, would give figures of £990 and £10 respectively at the valuation date. The sum of the policyholder liability and shareholder interest equals the assets held i.e. £1,000. The result is independent of the unit growth rate chosen, therefore, to simplify the arithmetic, for the remainder of this example we will assume a unit growth rate of 0% per annum.

8.8 While the above logic is perfectly reasonable, it is worth noting that using embedded value methodology different values of liabilities arise from the use of different unit growth rates. This reiterates the point made in paragraph 5.10 that embedded value techniques are not acceptable under the current fair value proposals since they do not necessarily place a market consistent value on assets.

8.9 Extending the example one step further we can now consider a policy with a unit fund of £1,000, annual premiums of £100 (received in arrears), an annual management charge (AMC) of 1% and an outstanding term of 10 years. The value of the unit fund paid on maturity in respect of the initial £1,000 unit fund would be derived as follows:

Value of maturity fund from initial £1,000 unit fund = $1000 \times 0.99^{10} = £904.38$

From this we can derive the value of future annual management charges in respect of the initial £1,000 unit fund as the balancing item:

Value of AMC from initial unit fund = 1,000 - 904.38 = £95.62

Similarly, the value of future management charges in respect of the first £100 premium at the point at which that premium is received would be as follows:

Value of AMC from first premium = $100 \times [1 - 0.99^{9}] = £8.65$

This figure needs to be discounted back one year to obtain its value at the valuation date. Given that this value is not dependent on the fund performance during the first year, it is appropriate to discount at the risk-free rate of return. So assuming a risk-free return of 5% per annum would give a fair value of the management charges in respect of the first premium of £8.24. This process can be repeated for all future premiums to obtain the fair value of all future management charges.

Unit-linked product

8.10 We now consider a more realistic unit-linked contract. The product modelled is a regular premium unit-linked personal pension plan. The assumptions we have used are set out in detail in Appendix A but in summary the product parameters are as follows:

- policyholder is a male aged 55 paying a regular premium of £1,200 per annum until retirement (at age 65);
- an initial unit fund of £5,000;
- policy charges of 3% of each premium, an annual management charge of 1% of funds under management and a policy fee of £3 per month;
- waiver of premium benefit at a cost of 3% of premium; and
- claim payments are equal to the unit account.

8.11 As noted in paragraphs 4.2 to 4.6, it seems unlikely that pure investment based unit-linked products will be classified as insurance business under the new standard. In this example there is a waiver of premium benefit. Since from the insurer's perspective a waiver of premium claim would cause a significant change in the present value of cash flows arising under the policy (see paragraph 4.5), the policy would probably be classified as an insurance product.

Base case

8.12 The results are set out in Table 8.1. At this stage the fair value figures exclude any allowance for non-market risk.

Table 8.1: Comparison of liability and profits for a unit-linked product (£)

	Prudential reporting	Embedded Value	Fair value
Liability	**(5,000)**	**(4,475)**	**(4,423)**
1	65	42	33
2	71	40	32
3	76	38	30
4	80	35	28
5	82	31	25
6	84	27	22
7	85	22	18
8	85	17	14
9	84	12	10
10	83	6	5
Total	**(4,205)**	**(4,205)**	**(4,205)**

Commentary on results

8.13 No non-linked reserves are required for this product (waiver premiums are assumed to be paid in arrears) and the prudential reserve is therefore simply equal to the unit fund. Profits arise in years 1 to 10 as charges exceed expenses. As in the non-profit examples, the sum of the profits released and the initial liability is the same under all three methods.

8.14 Under the embedded value methodology profits are capitalised at inception and the initial liability is therefore below the unit reserve. Since we are assuming that the embedded value assumptions are borne out in practice, profits in future years simply represent the unwinding of the risk discount rate on the value of in-force business at the start of the year.

8.15 In this example the fair value calculation includes no allowance for non-market risk and the initial liability is the lowest of the three methods. Subsequent profits are also lower than under the other three methods. For this product fair value profits arise from the return on assets exceeding the unwinding of the risk-free discount rate on the fair value liabilities (including growth in the value of units increasing the value of unit related charges).

Allowance for non-market risk

8.16 The process for deriving the risk adjustments would be similar to that set out in the previous section. Table 8.2 summarises the expected and risk-adjusted fair value assumptions (note that no risk adjustment has been made in respect of the waiver benefit).

Table 8.2: Expected and risk-adjusted assumptions for unit-linked product

	Expected assumptions	**Risk-adjusted fair value assumptions**
Mortality	90.0% AM92	92.5% AM92
Expenses	£40.00 p.a.	£42.00 p.a.
Inflation	RPI plus 1.5% p.a.	RPI plus 1.75% p.a.
Transfers/PUPs	10.00% p.a.	12.50% p.a.

8.17 Using these risk adjustments Table 8.3 sets out the revised fair value figures relative to the embedded value, prudential reporting and fair value (excluding non-market risk margins) results.

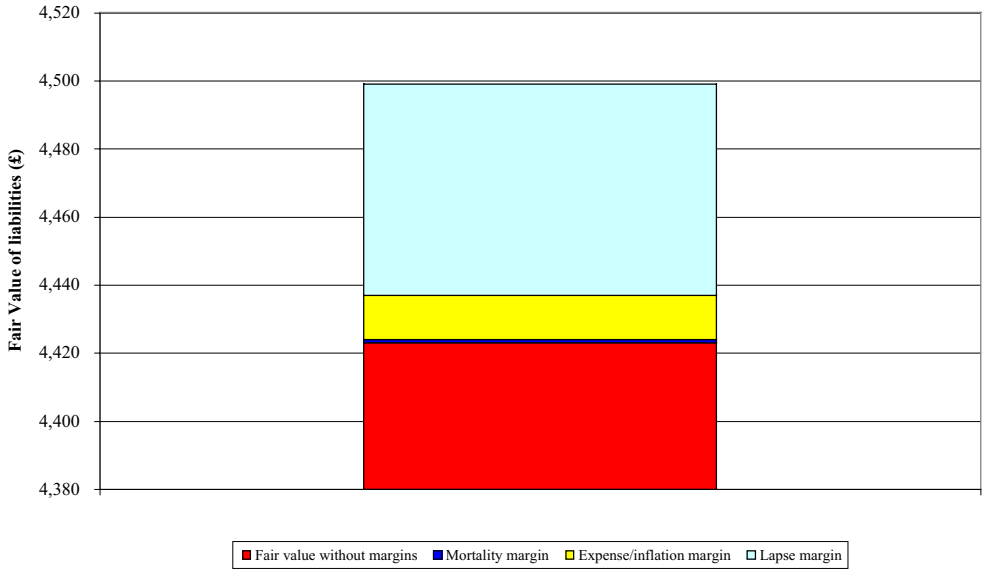
Table 8.3: Impact of introducing risk margins for a unit-linked product (£)

	Prudential Reporting	**Embedded Value**	**Fair Value**	
			Unadjusted	**Risk-adjusted**
Liability	**(5,000)**	**(4,475)**	**(4,423)**	**(4,499)**
1	65	42	33	45
2	71	40	32	43
3	76	38	30	41
4	80	35	28	38
5	82	31	25	34
6	84	27	22	30
7	85	22	18	25
8	85	17	14	19
9	84	12	10	13
10	83	6	5	6
Total	**(4,205)**	**(4,205)**	**(4,205)**	**(4,205)**

Commentary on results

8.18 The introduction of risk margins into the fair value calculation increases the fair value liability from £4,423 to £4,499. Graph 8.1 analyses the change in the fair value of the liabilities at the start of the projection period resulting from the introduction of each of the risk adjustments in turn.

Graph 8.1: Impact of introducing risk margins on fair value of liabilities



8.19 This product has no life cover. Introducing a mortality risk margin increases the liability very slightly since it reduces future premiums (and hence charges). This may not be the case if we were modelling a product with significant levels of death cover. For example, it is not uncommon for unit-linked life products to offer a death benefit equal to the greater of a fixed sum assured and the unit fund.

8.20 Where this is the case the fair value of the death benefit will depend on the volatility of the assets held and therefore on the mix of the assets. This means one would generally expect the cost of the death benefit for an equity-backed fund to be greater than for a fixed interest fund and in theory it would be necessary to price the cost of the death benefit by using stochastic projections. However, in practice some form of approximation would almost certainly be used, particularly if the death benefit is not material in the context of the whole product or if death benefits are matched by mortality charges.

8.21 As with mortality the introduction of expense and inflation risk margins does not have a significant effect on the results for this product. The transfer/PUP assumption is clearly the most significant. This is intuitive given that the majority of margins arising on this product are fund related.

Introducing an investment guarantee

8.22 We now consider the complications associated with valuing a unit-linked contract with an investment guarantee. In this example the guarantee is that the maturity benefit will not be less than the value of premiums rolled up with interest at 2% per annum and it is assumed that the investment policy of the fund does not take this guarantee into account.

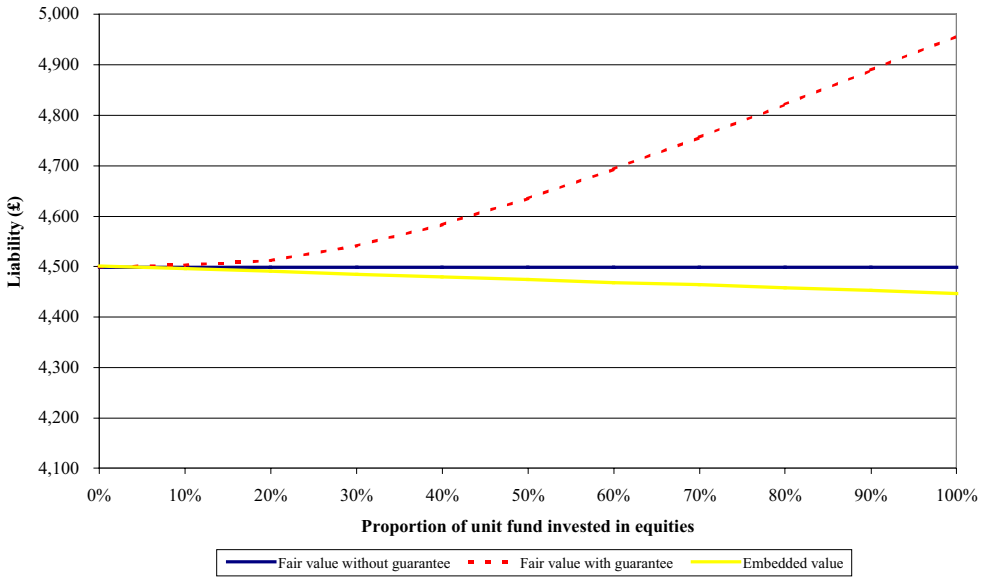
8.23 The method used to value this product is as follows:

- the basic policy liabilities are modelled in the same manner as in the previous examples in this section; but
- additional stochastic projections are performed to quantify the value of the maturity guarantee.

8.24 It is interesting to compare the fair value liabilities with those produced using traditional embedded value techniques. As noted in paragraph 8.8, traditional embedded value techniques do not necessarily place a market consistent value on the liabilities. Since the maturity guarantee we are modelling is out of the money on the embedded value basis, historically no value would generally be placed on this liability in the embedded value calculation. Moreover, unless compensated for in the choice of risk discount rate, greater equity investment would generally produce a lower embedded value liability.

8.25 Graph 8.2 compares the fair value liability (with and without maturity guarantee) with the embedded value liability for different mixes of fixed interest and equities.

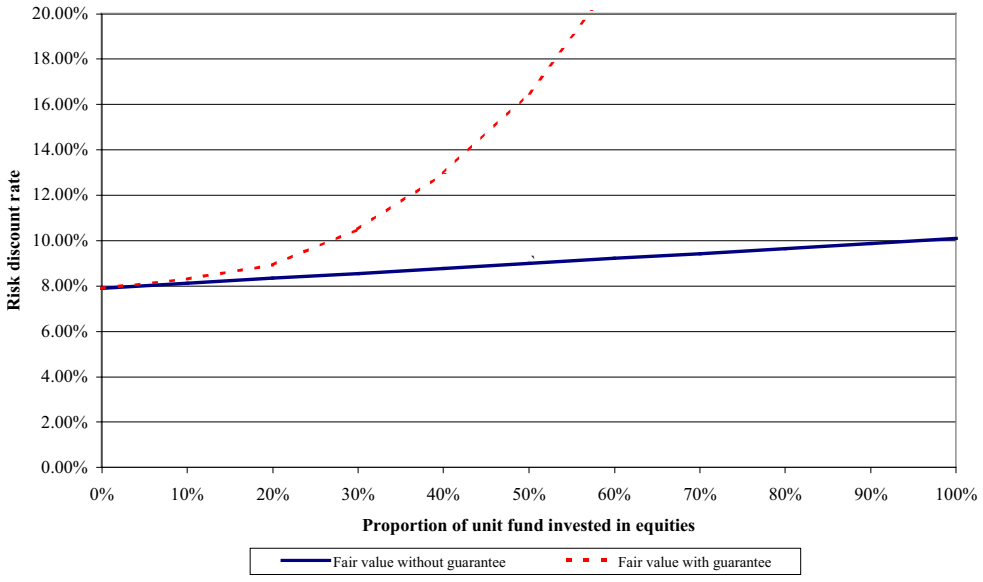
Graph 8.2: Comparison of fair value liability with embedded value liability



8.26 Since the fair value liability with no maturity guarantee is independent of the return on assets, its value does not change as the equity percentage increases. However, the fair value calculation with maturity guarantee is very sensitive to the mix of assets indicating that the cost of the investment guarantee increases substantially as the equity investment percentage increases. In contrast the embedded value liability calculated using a fixed risk discount rate, places no explicit value on the out of the money investment guarantee and decreases as the equity percentage (and hence unit growth rate) increases.

8.27 The above example indicates that, particularly when guarantees are introduced, fair value and embedded value calculations can give very different results. As noted above, in theory the impact of a guarantee could be allowed for in an embedded value calculation by increasing the risk discount rate assumed. To illustrate this point, Graph 8.3 shows the risk discount rate that would be required in order to equate the embedded value to the fair value (with and without maturity guarantees) for different mixes of fixed interest and equities.

Graph 8.3: Equivalent embedded value discount rate



8.28 The implied risk discount rate varies according to the level of equity investment and using an embedded value approach to allow for the cost of investment guarantees can lead to the use of high risk discount rates.

9 Illustrative examples: unitised with-profit business

9.1 In this section we will look at a fair value example for a portfolio of unitised with-profit contracts. Following an overview of the valuation approach and a discussion of the modelled portfolio we compare the fair value results with more traditional approaches.

Approach to fair valuation of with-profit

9.2 The DSOP groups with-profit and unit-linked policies together as participating contracts and suggests that the fair value of a 90/10 with-profit contract can be calculated in a similar way to a corresponding unit-linked policy. The only difference is that the policyholder interest in the fund's assets is 90% instead of 100% and there is an additional smoothing element. We have seen in section 8 that for unit-linked policies we generally do not require a projection of the fund and it would seem that this is also the case of with-profit contracts. However, this ignores the fact that virtually all with-profit policies contain financial guarantees.

9.3 A key question is whether stochastic modelling is really needed to value these guarantees. The Faculty and Institute of Actuaries Fair Value Working Party's report of November 2001 suggests that, for UK with-profit products, it may be possible to find suitable deterministic approximations, based on sample calculations of appropriately calibrated derivative pricing models.

9.4 Although this approximate approach would indeed be preferable, it has to consider all elements that influence the value of with-profit guarantees. In particular, the value of guarantees depends on the annual bonuses declared which are, within the boundaries of policyholders' reasonable expectations, subject to management discretion. For example, management will generally have regard to the solvency position when setting bonus levels and other discretionary management decisions such as smoothing, market value adjustments or changes in the investment strategy in adverse economic circumstances will also influence bonus levels. Clearly, it is difficult to design a deterministic method that allows for these interactions.

9.5 In contrast, stochastic modelling is able to account for all types of management decisions as long as the rules applicable to each economic scenario can be programmed. The resulting complexity of a fund level stochastic calculation is a widely recognised problem. Determining the fair value will not be substantially less work then performing an asset liability management study. Also, in view of current computer run times, it seems unlikely that individual policy projections will be performed and a model point approach will probably need to be taken.

9.6 Further testing of both deterministic and stochastic methods will be necessary to establish whether a deterministic approach can indeed capture the complexities of the business. The authors are not aware of any deterministic approximations for with-

profit business that have been suggested to date. For the purpose of the practical example in this section we have therefore applied the stochastic model point approach.

Stochastic modelling

9.7 As noted earlier, the DSOP states that stochastic modelling may be required to value guarantees but does not elaborate further. It can be assumed that the DSOP refers to a stochastic modelling approach known in option pricing literature as the Monte-Carlo technique. This is a very general approach and, provided the cash flows under the different stochastic scenarios can be defined, it can be applied to price any financial or indeed insurance contract.

9.8 For example, to price a simple call option the following steps are taken:

- asset returns are generated for different simulations and time steps;
- the pay-off of the contract is calculated at the expiry date of the option for each simulation;
- each pay-off is discounted back to the valuation date;
- the average is taken over all scenarios to arrive at the option price.

9.9 In most applications of Monte Carlo simulations the projected returns and the discount factors are conveniently based on the stochastic evolution of the risk-free rate. This is sometimes referred to as the 'risk neutral' framework. This framework can be used since financial theory dictates that option prices are not influenced by the assumed equity risk premium or risk preferences of the investor. Although this approach is perfectly viable to calculate fair values for insurance contracts, the resulting stochastic output is difficult to interpret from a 'real world' perspective.

9.10 An alternative method, that may be more suitable for auditing and accounting purposes originates from Harrison and Kreps (1979). Harrison and Kreps proved the existence of a state price deflator. This state price deflator is a more general discount factor that enables market consistent discounting of Monte Carlo simulations under any desired set of risk preferences. The advantage of the state price deflator method over the risk neutral approach is that we can use a more intuitive set of projected returns, incorporating for example a chosen equity risk premium.

9.11 Recently several actuarial papers have been published that recommend this technique to calculate market consistent values of insurance policies (see Appendix D). A thorough explanation of this technique is beyond the scope of this paper, but in summary the following approach would be taken to value a contract:

- Monte Carlo simulations of investment returns and state price deflators consistent with the financial market at a particular date are generated;
- these are fed through the liability model to project the contract's cash flows;

- the deflated value of the cash flow in year t is calculated as

  Cash flow(t) * Deflator(t);

- the fair value is calculated as the mean across all simulations (i) and years (t)

  $$\text{Fair value} = \text{Mean}_i\,(\text{Sum}_t\,(\text{Cash flow}\,(i,t) * \text{Deflator}(i,t)).$$

9.12 We have applied the state price deflator technique in the following practical example. A financial economic investment model was used to generate 1,000 simulations and corresponding state price deflators. The prices and returns for bonds and equities have been calibrated to the UK economy at 31 December 2001. More information on the model and the calibration can be found in Appendix C.

Modelled portfolio

9.13 The valuation date in the example is 31 December 2001.

9.14 The in-force portfolio consists of 25 identical unitised with-profit policies that incepted on 1 January in consecutive years from 1977 to 2001. Note again that we have modelled a portfolio rather than an individual policy to allow for the effect of smoothing and 'fund level' decision making.

9.15 The contracts and policy details (see also Appendix A) are similar to the unit-linked policies described in the previous section, but with the following important differences:

- The 1% annual management charge is replaced by a transfer of bonus to shareholders of one-ninth of the cost of bonuses declared to policyholders.
- The asset share at the valuation date is assumed to be equal to the past premium receipts accumulated at 5% per annum, taking into account the allocation rate but (for simplicity) no other charges.
- The unit account at the valuation date is assumed to be 75% of asset share.

Other assumptions

9.16 The following assumptions were made regarding asset share and bonus policy:

- Asset shares are accumulated at the total return achieved on the assets. Charges that are levied on the unit fund are debited to asset share. At maturity a pay-out of 100% of asset share is targeted, subject to smoothing and solvency considerations.
- Reversionary bonuses are targeted to result in a unit fund of 80% of asset share at maturity. The yearly change in reversionary bonuses is constrained and an overriding solvency constraint is applied to ensure, if possible, that the free asset ratio does not drop below 110%.

- Terminal bonuses at maturity are based on a weighted moving average of bonuses declared on maturing policies in the previous three years and the "unsmoothed" bonus supported by the asset share of the policy maturing in the current year.
- Terminal bonuses on surrender and death are declared at a level equal to the bonus declared for the most recently matured policy, multiplied by the ratio of duration elapsed over policy term.
- No market value adjustment is made on surrender unless the asset share is less than 90% of the unit fund, in which case the full difference between asset share and unit fund is deducted as a market value adjuster. This rule aims to reflect the fact that management would be reluctant to apply market value adjusters.

9.17 The investment mix is assumed to be constant and consists of 50% equities, 45% zero coupon bonds and 5% cash. The bond portfolio is reinvested each year to maintain a term of 10 years.

9.18 The total assets of the fund at the valuation date are equal to the total asset shares. The prudential (statutory) reserve includes the unit fund and any additional non-linked reserves. The starting free asset ratio (assets divided by prudential reserves) of the fund is 108%.

9.19 In our example no estate is allowed to build up from miscellaneous surplus. To achieve this the miscellaneous surplus or strain each year is applied proportionately to the asset shares.

Results

9.20 Table 9.1 provides an analysis of the fair value liability and compares it to the prudential reserve and asset share.

Table 9.1: Fair value of with-profit portfolio (£)

Premiums	(177,992)
Death benefits	25,038
Surrender benefits	232,865
Maturity benefits	471,095
Commission and Expenses	11,557
Fair value	**562,564**
Unit fund at start	438,563
Prudential reserve	540,646
Asset share at start	584,750

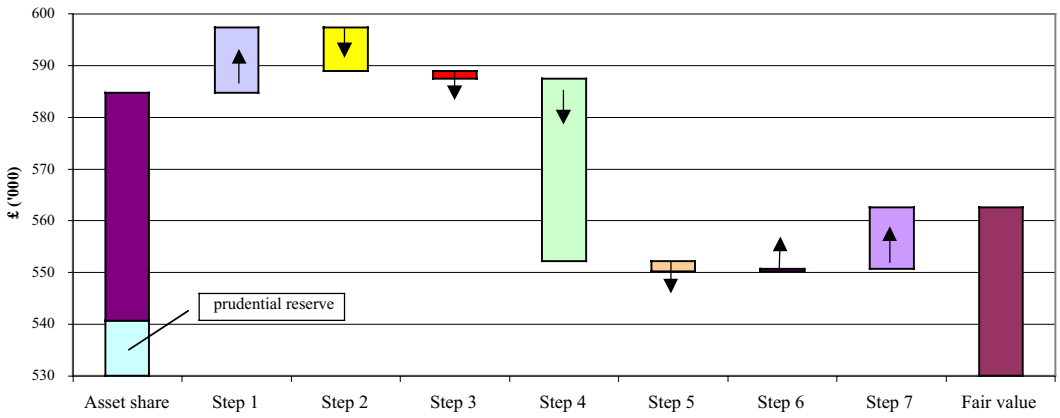
9.21 We can see that the fair value is greater than the prudential reserve. As discussed earlier, this is primarily because the prudential reserve does not include the value of future terminal bonus.

9.22 It turns out that the fair value liability is less than asset share. This means that in this example the cost of the guarantees does not offset the value extracted from the asset share and future premiums through expense charges, and by shareholders in the form of one-ninth of the cost of bonus.

Movement analysis

9.23 The fair value in this example is determined stochastically and it is therefore difficult to produce the profit profiles discussed in previous sections. Instead, to get a feel for the results, Graph 9.1 analyses the movement from asset share to fair value. The different steps are discussed in paragraphs 9.24 to 9.31

Graph 8.1 Analysis of movement from prudential reserve to fair value



9.24 In order to analyse the movement from asset share to fair value we have performed a series of calculations. We start by assuming there are no future decrements, charges or expenses and we analyse the value of a set of notional contracts that have a combined fair value equal to the starting asset share. These notional contracts are pure unit-linked contracts where the starting unit fund is equal to the starting asset share of the actual policies.

9.25 In step 1 we change these notional unit-linked contracts to equivalent unitised with-profit contracts where, starting from a unit fund equal to 75% of asset share reversionary bonuses are credited to the fund and a terminal bonus is given at maturity equal to the excess, if any, of the asset share over the unit fund including accumulated reversionary bonuses. At this stage we have assumed there are no shareholders to share in the bonuses. The fair value increases reflecting the cost of the guarantee introduced by moving from a unit-linked to a unitised with-profit contract.

9.26 The reversionary bonus in step 1 is declared at a policy level. In practice companies will have regard to their solvency position when declaring bonuses. Step 2 shows the

effect on fair value if we assume that the cost of maturity guarantees will be (partly) reflected in lower bonuses for remaining policies. These lower bonuses will in turn reduce the possibility of future guarantees biting. The resulting reduction in value clearly shows that the modelling of with-profit contracts at an individual policy level can materially overestate liabilities.

9.27 In step 3 we introduce the smoothing of terminal bonuses. The slight negative effect on the fair value can be explained as follows. In the absence of maturity guarantees the effect of smoothing is more or less neutral; the decrease in fair value as a result of downward smoothing in good scenarios is offset by the increase in fair value as a result of upward smoothing in bad scenarios. However if maturity guarantees such as those introduced in step 2 are present, then the effect of upward smoothing in bad scenarios is not fully reflected in cases where the guarantee bites. The pay out in these scenarios does not change as a result of introducing smoothing. This asymmetry leads to a small decrease in the fair value.

9.28 In step 4 shareholders are introduced and, since they get one-ninth of the cost of bonus, this reduces payments to the policyholder and results in a lower fair value of liabilities.

9.29 Until now we have assumed that there are no decrements. There are two effects of introducing decrements in step 5. The lower cost of maturity guarantees due to surrenders and mortality will reduce the fair value, whereas the fact that we do not apply a market value adjuster unless the asset share is below 90% of the fund value will increase the liability. Overall, the effect is slightly negative.

9.30 In step 6 we look at the effect of introducing expenses, commissions and charges. The charges and expenses in the unitised with-profit contract are more or less equal at the start of the contract (see Appendix A). However, as part of the market value margins we have assumed that charges inflate at the basic rate of inflation but that expenses inflate at a higher risk adjusted rate of inflation. The combined effect on the fair value liability is a small increase.

9.31 We are left with just one difference between the notional contracts in step 6 and the actual contracts in the base scenario. In the base scenario we have assumed that miscellaneous surplus emerging in each step will be credited to the asset shares of remaining policies at the next step. This will result in an increase in the fair value liability as can be seen in step 7.

9.32 This type of analysis gives a useful insight into the elements of difference between current prudential liabilities and fair value liabilities. However, it is worth noting that the order in which the different steps are performed makes a difference to the relative effect of the steps and to the resulting conclusions that are drawn.

Allowance for non-market risk

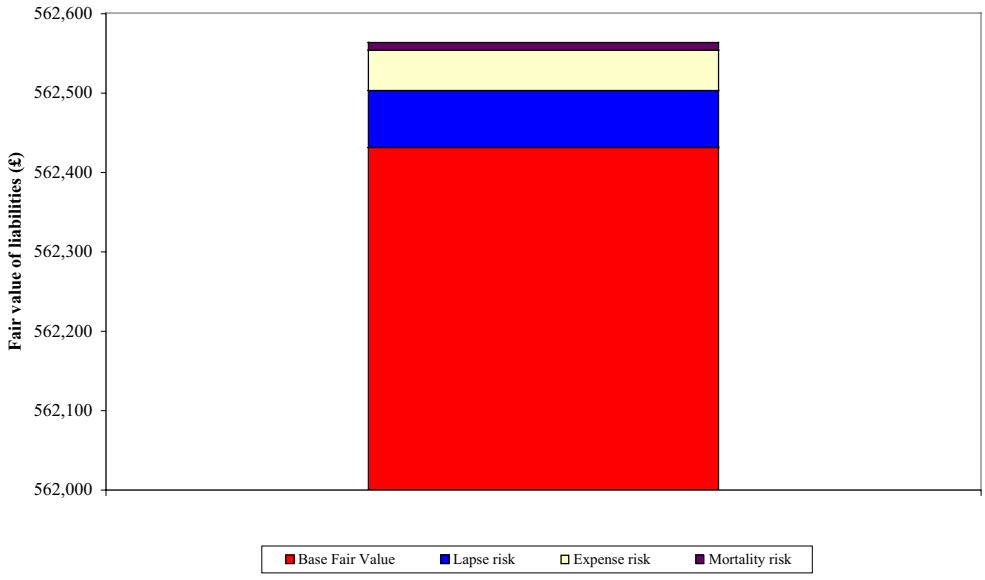
9.33 The fair value in Table 9.1 includes the following non-market related risk adjustments:

Table 9.2: Expected and risk-adjusted assumptions for unitised with-profit product

	Expected assumptions	Risk-adjusted fair value assumptions
Mortality	90.0% AM92	92.5% AM92
Expenses	£40.00 p.a.	£42.00 p.a.
Inflation	RPI plus 1.5% p.a.	RPI plus 1.75% p.a.
Transfers/PUPs	6.00% p.a.	7.50% p.a.

9.34 Graph 9.2 analyses the change in the fair value of the liabilities resulting from the introduction of each of the risk adjustments in turn. Perhaps surprisingly, the effect of each of the margins on the fair value liability is small. This is mainly a result of the assumption that any excess surplus or deficit that emerges in the fund is immediately credited to asset shares. The increase in fair value liability as a result of introducing the margins is offset in the projection by an almost equal lower value of future projected bonuses.

Graph 9.2: Impact of introducing risk margins on fair value of liabilities



Comparison with embedded value

9.35 It is interesting to compare the fair value liability with that calculated using traditional embedded value techniques. For the purpose of the embedded value calculation we have assumed that cash and risk-free yields are 5% per annum and equities earn a 3% per annum risk premium. These returns are broadly in line with the calibration of the asset model.

9.36 As we saw in paragraph 5.9, using embedded value techniques the value of liabilities can be obtained indirectly as the prudential reserves (or asset share in the case of with-profit business) less the value of in-force business. Table 9.3 shows the value of these liabilities using a risk discount rate of 8.0% per annum and the equivalent embedded value discount risk of 7.85% required for the embedded value liability to equal the fair value liability.

Table 9.3: Comparison of fair value and embedded value liability (£)

Asset share	584,750
Embedded value @8.00%	21,995
Liability implied by embedded value	**562,755**
Fair value liability	562,564
Equivalent embedded value discount rate	7.85%

Conservation of value

9.37 It is useful to apply a check on the stochastic fair value calculation to ensure that no value has been created or destroyed in the projections. This can be done by summing the fair value cash flows across all stakeholders. The fair value liability already represents the sum of values distributed to three stakeholders: the policyholder (benefit cash flows), staff (expenses) and agents (commissions). Table 9.4 shows that if the value of the shareholder transfers is added, the sum of the stakes equals the starting assets of the fund (subject to sampling error).

Table 9.4: Stakeholder analysis (£)

	£	% of total
Policyholders (A)	551,007	94.2%
Agents (B)	4,239	0.7%
Staff & expenses (C)	7,318	1.3%
Fair value of liabilities	**562,564**	**96.2%**
Shareholders (D)	22,495	3.8%
Total of stakes (A+B+C+D)	**585,059**	**100.0%**
Starting assets (=Asset shares)	584,750	

Sensitivities

9.38 An insurance company would typically carry out additional runs to assess the sensitivity of the base fair value to different assumptions. These may include the following:

- Assumed bonus rules and levels of smoothing.
- Asset mix (and in particular different equity backing ratios).
- Economic circumstances (e.g. movements in the yield curve).

9.39 We know from section 8 that, in the absence of any guarantees, for unit-linked policies the only financial sensitivity that alters the fair value is a movement in the yield curve. From this we can deduce that, for with-profit policies, any changes in fair value resulting from other sensitivities would need to have arisen as a result of changes in the value of the implicit guarantees.

9.40 The sensitivity of the total fair value therefore depends on how far 'in-the-money' the guarantees are at the valuation date and the level of smoothing that is applied. In Graph 9.1 we saw that a fund level stochastic calculation can result in a substantial reduction in the value of guarantees compared to an aggregate value based on individual policy modelling.

New business

9.41 We end this section with an outstanding issue in the DSOP with respect to with-profit policies. In the base scenario we have only modelled the run off of the existing block of contracts and ignored new business. This seems to be in line with Principle 4.3 in the DSOP which states that cash flows from future insurance contracts should be excluded from the fair value.

9.42 However, it is unclear if the *influence* of new business should be excluded altogether. In reality the projected bonuses for in-force with-profit policies may be indirectly impacted by the effect of new business cash flows. For example, bonus levels may initially suffer from the strain on solvency of initial expense and commission related to new business, but may increase in the longer term if the new business is written on profitable terms. It could be argued that the smoothing of surpluses between generations of policyholders forms an integral part of a with-profit fund and should therefore be reflected in the fair value.

9.43 On the other hand, projecting future new business introduces further subjectivity and adds considerably to the complexity of the fair value calculation. Moreover, if we include the influence of future new business, should the effect of planned capital injections or financial reinsurance deals also be included in the projections? Hopefully this issue will be resolved once the final chapter of the DSOP is published.

10 Business issues

10.1 In this section we consider some of the wider business issues that may arise as a result of the movement towards a fair value based accounting system.

Practical issues

10.2 The European Union has indicated a desire for all listed insurers to report fair value results by the end of 2005. If this is to be the case then comparative figures would be required for the end of 2004 which means that processes and systems would need to be in place by the beginning of 2004. A number of practical issues will need to be addressed by insurance companies before this time. These include the following:

- resource and training requirements; and
- systems development.

10.3 Clearly insurance companies will need to acquire the skills necessary to enable them to perform fair value calculations. For many products the mechanics of carrying out fair value calculations will not be too different from the calculations already being performed (e.g. in embedded value calculations). However, there are areas where development will be required. For example:

- more detailed analysis of experience (e.g. lapse/mortality) will be required in order to quantify risk more accurately;
- wider understanding of option pricing techniques will be required to model products with embedded financial guarantees;
- management will be required to understand and explain the figures and be aware of the business issues (e.g. impact on capital requirements) resulting from the introduction of fair value accounting.

10.4 The introduction of fair value will have significant systems implications. Although for some products it will still be possible to use modified commutation functions, for the majority cash flow projections will be required. In summary, for a system to be able to calculate fair values at a given point in time it should ideally have the following features:

- an ability to project and discount cash flows on a fair value basis;
- an ability to perform step by step projections e.g. for with-profit business policies (or model points) would be projected for one time period and the results combined across the whole portfolio. Decisions would then be made relating to bonus declarations/asset allocations before the projection continues to the next time period;
- an ability to perform stochastic projections and to incorporate the results produced from an appropriate asset model e.g. to model products with embedded options.

10.5 The above requirements are those needed to be able to calculate fair values at a given point in time. If a projection of fair value profits is required (e.g. for budgeting/business planning) then the system requirements become more onerous. For example, even for the most straightforward of products, one would need the ability to perform fair value projections at each future valuation date. For with-profit business this would potentially involve performing stochastic runs within stochastic runs.

Asset allocation

10.6 As we have seen, if a contract is matched by a replicating portfolio and the expected assumptions are borne out in practice, then fair value profits only arise as a result of releases in the risk margins inherent in the fair value basis. In practice additional profits or losses will arise from variations in assumptions and from the mismatching of assets and liabilities.

10.7 It seems likely that mismatching calculations will become more complex in a fair value world. Traditionally actuaries have allowed for price movements (e.g. a fall in equity prices) and interest rate movements in their mismatching calculations. Under fair value more complex calculations, such as testing the sensitivity of results to changes in volatilities, will be required. Asset allocation will therefore continue to be important in a fair value world.

10.8 Companies seeking to minimise the volatility of results may try to invest as closely as possible in the replicating portfolio. For a fully matched book of contracts the market value of assets and fair value of liabilities will generally move approximately in parallel with little impact on the profit and loss account.

10.9 For non-profit contracts most insurers already back their liabilities with fixed income securities and the assets held are therefore similar to the replicating portfolio. For example, the replicating portfolio for an annuity portfolio could be in risk-free bonds, whereas the actual investments may be a mixture of risk-free and corporate bond assets.

10.10 The fair value of a with-profit contract is based on a stochastic projection of bonuses that assumes a certain investment mix and bonus strategy. If the asset mix is arbitrarily selected then it is unlikely to coincide with the replicating portfolio since, for example, a change in the yield curve will have a different effect on the assets than on the liabilities. In theory a hypothetical portfolio of assets could be found that behaves in the same manner as the liabilities and is consistent with policyholders' reasonable expectations. In practice if an insurer is seeking to minimise the volatility of its profit and loss account then it could invest in this hypothetical portfolio.

10.11 In addition an insurer could choose to reduce the volatility of its profit and loss account by hedging its guarantees. There would of course be a cost in doing so. However, if for example the insurer had exposure to a particular guarantee (e.g. a guaranteed annuity option) and chose not to hedge its position then, if other insurers did hedge their exposure thus driving up the cost, then the cost of the guarantee would increase.

Prudential reporting and availability of capital

10.12 As noted in sections 2.11 to 2.15, in parallel to the work being done by the IASB, a considerable amount of effort is also being put into reviewing the system of reporting for prudential regulatory purposes. The conclusion of the UK Faculty and Institute working party looking into this matter was that a movement towards a risk-based capital approach for prudential reporting was desirable.

10.13 Indeed it would seem that, in order to assess some of the risks being run by an insurance company, information arising from the prudential valuation is vital. For example, one of the objectives of fair value accounting is to achieve greater comparability of insurers. However, fair value accounts specifically ignore any mismatching between assets and liabilities. If an insurer is matching an annuity portfolio with equities then this is clearly more risky than matching it with risk-free bonds. However, this additional risk will not be reflected in the GAAP accounts. This problem could be overcome by the disclosure in GAAP accounts of additional information on resilience to market movements.

10.14 Reinsurance financing and securitisations are generally based on the emergence of prudential statutory profits. It is unclear how these profits will be affected by the introduction of a fair value based prudential reporting system. However, the following questions will need to addressed:

- Will prudential profits under fair value be larger or smaller than at present?
- Will prudential profits be more volatile under a fair value based system?
- Will the sources of prudential profit be different under a fair value based system?

Risk management

10.15 In recent years the management of risk within the financial services industry has become increasingly sophisticated. However, due to differences in the risks being run, the assessment of risk by different participants has been quite different. Banks have tended to rely on short-term value at risk ("VaR") models whereas in contrast insurance companies have historically measured risk over the longer term. The introduction of a fair value based accounting system will give renewed focus to the analysis of risk within the insurance sector and is likely to bring about a convergence of the treatment of risk within the financial services industry.

10.16 Under fair value, analysis and disclosure of the different risks being run by the insurer will be required. This will lead to a greater understanding of the risks and of the capital required to cover them. In addition, especially if complemented by a risk based capital approach to prudential reporting, the following questions can also be addressed:

- How much capital does the company need to operate efficiently?
- What opportunities are there for managing regulatory capital requirements?

- Can the company operate more efficiently by transferring risk (e.g. through reinsurance or by hedging)?

10.17 Although for GAAP reporting fair value calculations require the use of market risk preferences, for internal purposes these may need to be adjusted to reflect the risk preferences of the entity rather than the market. For individual insurance companies there will be merit in developing an internal risk management strategy, possibly built on the back of a fair value based system, that allocates capital more efficiently between different risks.

10.18 Historically actuaries have concentrated primarily on the assessment of insurance and financial risks although in recent years insurance companies have suffered substantial losses in other areas (e.g. compliance related issues such as pension miss-selling). Additional risk measures will need to be developed to model operational and compliance risk and current measures of mismatching risk will no doubt be refined.

Product design and pricing

10.19 The introduction of fair value reporting will have many implications for both product design and pricing. At an early stage the following questions will need to be addressed:

- How do we decide whether a product offers the minimum required profitability level?
- What are the capital requirements of the product (both on a GAAP and prudential reporting basis)?
- If based on a fair value calculation what additional adjustments may be required (e.g. to reflect the cost of capital)?
- What are the implications for product design of the unresolved issues (e.g. definition of insurance contracts and allowance for future premiums) described in section 4?

10.20 Traditional product pricing techniques are based on projections of prudential statutory profits. However in sections 7 to 9 we saw that traditional and fair value methods can give very different profit profiles. For example, in the annuity example the initial fair value liability was greater (and hence the initial profit recognised was lower) than under embedded value reporting. In addition, in the past insufficient regard has been had for pricing and charging for financial guarantees within products. The potential impact of this was brought out in both the unit-linked and unitised with-profit examples.

10.21 It is not clear what criteria will be used for assessing product profitability in a fair value world. While the current approach of basing pricing decisions on distributable profits may be retained, it is likely that regard will also be had for the impact on fair value profits.

Mergers and acquisitions

10.22 It seems inevitable that fair value will have an effect on both the financial drivers behind merger and acquisition ("M&A") activity and the basis on which transaction prices are determined.

10.23 In theory the transaction price under fair value should be based on:

- the market value of assets;
- less the fair value of liabilities;
- less provisions for taxes and other creditors excluded from fair value;
- less adjustments for the cost of capital;
- plus goodwill.

10.24 How this compares to traditional appraisal values is largely unknown at this stage and it will be interesting to see whether traditional valuation techniques survive the move to a fair value based system. However, it can be expected that as we approach 2005, investors will become increasingly interested in analysing the affect an M&A deal has on projected fair value profit.

10.25 After 2005 the fair value is likely to be the starting point for negotiations. Subsequent discussion and additional calculations will focus on the level of risk margins, the cost of capital and the goodwill value.

11 Summary and conclusions

11.1 The IASB project to introduce fair value accounting for insurance assets and liabilities is progressing rapidly. The DSOP is due to be finalised in the coming few months and will be followed by an exposure draft on the new accounting standard later this year.

11.2 For most product classes the mechanics of performing fair value calculations will more complex than under current regimes. This is particular true for with-profit business where it seems likely that sophisticated liability and asset models will be required.

11.3 In general the movement towards a fair value based system should encourage better risk management. If implemented correctly this should lead to less volatile fair value profits as well as lower capital requirements. In addition fair value lends itself well to a risk based capital approach for prudential reporting which will be welcomed by regulators and should encourage greater harmonisation within the financial services sector.

11.4 Although recent progress has been rapid there still remain a number of unresolved issues. Areas of subjectivity remain where guidance will be required and further questions still need to be answered. For example, a greater understanding of the components of actuarial and operational risk will be required to ensure that a consistent approach to risk adjustment is achieved.

11.5 Fair value will affect many aspects of the management of a life insurance company. Management will be required to understand and explain figures and to be aware of the many business issues resulting from the introduction of fair value accounting. These will include:

- The practical issues that need to be addressed (e.g. resources, training and system upgrades).
- The impact on reported profits (we saw in sections 7 to 9 that this can vary from one product to another).
- The implications for product design, asset allocation, solvency reporting and risk management.

11.6 These business issues will have an immediate impact. However, having committed to an approach on day one, it will be harder to control future results than is currently the case unless changes are made to the way in which the business is run.

11.7 Overall the authors believe that a move towards a fair value based system is desirable. Despite the increased complexity of the calculations there are many benefits of taking a market consistent approach. It would seem that in a fair value world accounts will indeed be more transparent, consistent and easily understood than is currently the case.

A Assumptions

Pension term assurance

Financial assumptions

Embedded value discount rate	:	8.0% p.a.
Risk-free rate of return	:	5.0% p.a. at all durations
Investment return on assets	:	5.5% p.a.
Inflation	:	4.0% p.a.
Tax	:	No allowance

Demographic assumptions

Male aggregate mortality	:	80% TM92
Lapse rates	:	5.0% p.a.

Expenses

Maintenance expense	:	£20.00 p.a. per policy inflating

Statutory valuation reserves

Net premium reserves are calculated using the following assumptions:

Interest	:	4.0% p.a.
Male non-smokers	:	90% TM92

Fair value risk-adjusted assumptions

Male aggregate mortality	:	82.50% TM92
Lapse rates	:	3.75% p.a.
Maintenance expense	:	£21.00 p.a. per policy inflating
Inflation	:	4.25% p.a.

Model point information

Age at entry	:	40
Sex	:	Male
Original policy term	:	20 years (with 10 years outstanding)
Premium	:	£180 p.a.
Sum assured	:	£50,000

Pension Annuity

Financial assumptions

Embedded value discount rate	:	8.0% p.a.
Risk-free rate of return	:	5.0% p.a. at all durations
Investment return on assets	:	5.5% p.a.
Inflation	:	4.0% p.a.
Tax	:	No allowance

Demographic assumptions

Male mortality	:	90.00% PMA92 (year of birth table)

Expenses

Commission	:	1.5% of premium
Initial expenses	:	£100
Maintenance expenses	:	£20.00 p.a. per policy inflating

Statutory valuation reserves

Reserves are calculated using the following assumptions:

Interest	:	5.0% p.a.
Male mortality	:	80.00% PMA92 (year of birth table)
Maintenance expense	:	£24.00 p.a. per policy inflating

Fair value risk-adjusted assumptions

Male mortality	:	87.50% PMA92 (year of birth table)
Maintenance expense	:	£21.00 p.a. per policy inflating
Inflation	:	4.25% p.a.

Model point information

Age at entry	:	65
Sex	:	Male
Premium	:	£30,000
Annuity	:	£2,500 p.a.

Unit-linked Personal Pension

Financial assumptions

Embedded value discount rate	:	8.0% p.a.
Risk-free rate of return	:	5.0% p.a. at all durations
Return on equities	:	8.0% p.a.
Investment return on unit funds	:	6.5% p.a. (50/50 equity/risk-free split)
Inflation	:	4.0% p.a.
Tax	:	No allowance

Demographic assumptions

Mortality	:	90% AM92
Transfer/PUP rates	:	10.0% p.a.

Expenses

Maintenance expenses	:	£40.00 p.a. per policy inflating
Renewal commission	:	2.5% of each premium

Charges

Annual management charge	:	1.0% p.a. of funds under management
Initial charge	:	3.0% of each premium
Policy fee	:	£36.00 p.a. per policy inflating

Fair value risk-adjusted assumptions

Male aggregate mortality	:	92.50% AM92
Transfer/PUP rates	:	12.5% p.a.
Maintenance expense	:	£42.00 p.a. per policy inflating
Inflation	:	4.25% p.a.

Model point information

Age at valuation	:	55
Sex	:	Male
Initial unit fund	:	£5,000 (based on 5 years of premiums)
Original policy term	:	15 years (with 10 years outstanding)
Premium	:	£1,200 p.a.
Death/transfer benefit	:	Return of unit fund
Other benefits	:	Waiver of premium benefit

Unitised With-Profit Personal Pension

Financial assumptions

Embedded value discount rate	:	8.0% p.a.
Risk-free rate of return	:	Consistent with current yield curve
Investment return on unit funds	:	6.5% p.a.
Inflation	:	4.0% p.a.
Tax	:	No allowance

Demographic assumptions

Mortality	:	90% AM92
Lapse rates	:	6.0% p.a.

Expenses

Maintenance expenses	:	£40.00 p.a. per policy inflating
Renewal commission	:	2.5% per annum

Charges

Initial charge	:	3.0% of each premium
Policy fee	:	£36.00 p.a. per policy inflating

Fair value risk-adjusted assumptions

Mortality	:	92.5% AM92
Lapse rates	:	7.5% per annum
Maintenance expenses	:	£42.00 p.a. per policy inflating
Inflation	:	4.25% p.a.

Model point information

Age at valuation	:	40
Sex	:	Male
Initial unit fund	:	75% of accumulated asset share
Original policy term	:	25 years
Premium	:	£1,200 p.a.
Death benefit	:	Return of unit fund
Surrender benefit	:	Return of unit fund with market value adjustment if asset share is below 90% of fund
Shareholder share	:	$1/9^{th}$ of cost of bonus
Portfolio	:	25 identical in-force policies incepting at 1 January of each year from 1977

B Summary of DSOP

Chapter 1: Scope

Principle 1.1 - Scope

A future International Financial Reporting Standard on Insurance Contracts (the Standard) should prescribe the accounting and disclosure in general purpose financial statements by insurers and policyholders for all insurance contracts, other than those excluded by principle 1.5. The Standard should not address other aspects of accounting by insurers or policyholders (except as specified in principles 4.9, 7.4, 10.1, 10.2, and 11.2.

Principle 1.2 - Definition of insurance contract

Insurance contracts should be defined as follows in all International Financial Reporting Standards and International Accounting Standards.

An insurance contract is a contract under which one party (the insurer) accepts an insurance risk by agreeing with another party (the policyholder) to compensate the policyholder or other beneficiary if a specified uncertain future event (the insured event) adversely affects the policyholder or other beneficiary (other than an event that is only a change in one or more of a specified interest rate, security price, commodity price, foreign exchange rate, index of prices or rates, a credit rating or credit index or similar variable).

Principle 1.3 - Amount of insurance risk required for a contract to qualify as an insurance contract

A contract creates sufficient insurance risk to qualify as an insurance contract if, and only if, there is a reasonable possibility that an event affecting the policyholder or other beneficiary will cause a significant change in the present value of the insurer's net cash flows arising from that contract. In considering whether there is a reasonable possibility of such significant change it is necessary to consider both the probability of the event and the magnitude of its effect.

Principle 1.4 - Changes in the level of insurance risk

A contract that qualifies as an insurance contract at inception or later remains an insurance contract until all rights and obligations are extinguished or expire. If a contract did not qualify as an insurance contract at inception, it should be subsequently reclassified as an insurance contract if, and only if, a significant change in the present value of the insurer's net cash flows becomes a reasonable possibility (see principle 1.3)

Principle 1.5 - Scope exclusions

Although the following items arise under contracts that may meet the definition of insurance contracts, they should be excluded from the scope of the Standard:

- **a.** financial guarantees (including credit insurance) measured at fair value;
- **b.** product warranties issued directly by a manufacturer, dealer or retailer;
- **c.** employers' assets and liabilities under employee benefit plans (including equity compensation plans);

d. retirement benefit obligations reported by defined benefit retirement benefit plans,

e. contingent consideration payable or receivable in a business combination; and

f. contractual rights or contractual obligations that are contingent on the future use of, or right to use, a non-financial item (for example, certain licence fees, royalties, lease payments and similar items)

Principle 1.6 - Bundled contracts

An insurer or policyholder should not account separately for the components of an insurance contract that bundles together:

a. an insurance element and a non-derivative investment element; or

b. an embedded derivative and a host insurance contract.

Chapter 2: Overall approach, recognition and derecognition

Principle 2.1 - A single recognition and measurement approach for all forms of insurance

There should be a single recognition and measurement approach for all forms of insurance contracts, regardless of the type of risk underwritten.

Principle 2.2 - Recognition

Insurance assets and insurance liabilities are assets and liabilities arising under an insurance contract. An insurer or policyholder should recognise:

a. an insurance asset when, and only when, it has contractual rights under an insurance contract that result in an asset; and

b. an insurance liability when, and only when, it has contractual obligations under an insurance contract that result in a liability.

Principle 2.3 - Derecognition

An insurer or policyholder should derecognise an insurance asset or insurance liability or a component of an insurance asset or insurance liability when, and only when, it no longer has the contractual rights or the contractual obligations that resulted in that insurance asset, insurance liability or component.

Chapter 3: Measurement: Overall issues

Principle 3.1 - Measurement objective

While IAS 39, "Financial Instruments: Recognition and Measurement", is still in place, insurance liabilities and insurance assets should be measured at entity-specific value. Entity-specific value represents the value of an asset or liability to the enterprise that holds it, and may reflect factors that are not available (or not relevant) to other market participants. In particular, the entity-specific value of an insurance liability is the present value of the costs that the

enterprise will incur in settling the liability with policyholders or other beneficiaries in accordance with its contractual terms over the life of the liability.

If a successor standard to IAS 39 introduces fair value measurement for the substantial majority of financial assets and liabilities, IASB should consider introducing fair value measurement for all insurance liabilities and insurance assets. 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 a third party at the balance sheet date to take over the liability.

Principle 3.2 - Interaction with measurement of an insurer's non-insurance financial assets

The entity-specific value or fair value of insurance liabilities should not be affected by the type of assets held or by the return on those assets (unless the amount paid to policyholders is directly influenced by the return on specified assets, as with certain performance-linked contracts, as discussed in chapter 7).

Principle 3.3 - Neutrality

Overstatement of insurance liabilities in general purpose financial statements should not be used to impose implicit solvency or capital adequacy requirements.

Principle 3.4 - Annual basis of accounting

Deferred and fund methods of accounting should not be used.

Chapter 4: Estimating the amount and timing of cash flows

Principle 4.1 - Expected present value of all future cash flows

The starting point for measuring insurance assets and insurance liabilities should be the expected present value of all future pre-income-tax cash flows arising from the contractual rights and contractual obligations associated with the closed book of insurance contracts. Those cash flows include estimates of future:

a. payments to policyholders under existing contracts, and related claim handling expenses;

b. premium receipts from policyholders under existing contracts, including retrospective adjustment to premiums;

c. future policy loans to policyholders, and repayments by policyholders of principal and interest on current and future policy loans;

d. transaction-based taxes and levies relating to existing contracts;

e. policy administration and maintenance costs;

f. recoveries, such as salvage and subrogation, on unsettled claims and potential recoveries on future claims covered by existing insurance contracts.

Principle 4.2 - Renewals

In applying principle 4.1, cash flows arising from the contractual rights and obligations associated with the closed book of insurance contracts should include cash flows from future renewals to the extent, and only to the extent, that:

a. their inclusion would increase the measurement of the insurer's liability; or

b. policyholders hold uncancellable renewal options that are potentially valuable to them.

Principle 4.3 - Cash flows excluded

The following future cash flows should not be included in determining the expected present value of future pre-tax cash flows arising from the closed book of insurance contracts:

a. income tax payments and receipts;

b. cash flows arising from future insurance contracts;

c. payments to and from reinsurers;

d. investment returns from current or future investments (except for certain performance-linked contracts, see chapter 7); and

e. cash flows between different components of the reporting entity.

Principle 4.4 - Assumptions

In determining entity-specific value, each cash flow scenario used to determine expected present value should be based on reasonable, supportable and explicit assumptions that:

a. Reflect

i) all future events, including changes in legislation and future technological change, that may affect future cash flows from the closed book of existing insurance contracts in that scenario;

ii) inflation by estimating discount rates and cash flows either both in real terms (excluding general inflation, but including specific inflation) or both in nominal terms; and

iii) all entity-specific future cash flows that would arise in that scenario for the current insurer, even cash flows that would not arise for other market participants if they took over the current insurer's rights and obligations under the insurance contracts;

b. in relation to market assumptions, are consistent with current market prices and other market-derived data, unless there is reliable and well-documented evidence that current market experience and trends will not continue. Such evidence is likely to exist only if a single, objectively identifiable, event causes severe and short-lived disruption to market prices. In such exceptional cases, the assumptions should be based on this reliable evidence; and

c. in relation to non-market assumptions, are consistent with the market assumptions discussed in (b) and with the most recent financial budgets/forecasts that have not

current and not intended as neutral estimates of future events, the insurer should adjust those assumptions. If the budgets and forecasts are deterministic, rather than stochastic, the entire package of scenarios should be consistent with the budgets and forecasts.

Principle 4.5 - Assumptions

When fair value is not observable directly in the market, fair value should be estimated by using principle 4.4, but with the following two differences.

a. Fair value should not reflect entity-specific future cash flows that would not arise for other market participants if they took over the current insurer's rights and obligations under the insurance contract.

b. If there is contrary data indicating that market participants would not use the same assumptions as the insurer, fair value should reflect that market information.

Principle 4.6 - Overheads

The future cash flows used to determine entity-specific value or fair value should include overheads that can be directly attributed to a book of insurance contracts, or allocated to it on a reasonable and consistent basis. These overheads should include a reasonable charge for the consumption of all assets used to generate the cash flows concerned. All other overheads should be excluded.

Principle 4.7 - Transaction costs

The fair value of an insurance liability (insurance asset) should be determined without adding (deducting) transaction costs that would be incurred on a settlement (sale).

Principle 4.8 - An insurer's own credit standing

The entity-specific value of an insurance liability should not reflect the insurer's own credit standing. Conceptually fair value should reflect the insurer's own credit standing, but this would have practical implications that need further investigation.

Principle 4.9 - Recoveries related to claims

Until rights to recoveries qualify for recognition as an asset under the following paragraph, an insurer should:

a. include potential recoveries from salvage and subrogation in estimated future cash flows from existing insurance contracts; and

b. not recognise those rights to recoveries as separate assets.

An insurer should recognise rights to recoveries, such as salvage rights and subrogation rights, as an asset when, and only when:

a. the insurer controls those rights, as a result of past events;
b. it is probable that the economic benefits associated with those rights will flow to the insurer; and

c. the insurer can measure those rights reliably. An insurer should measure those rights (including salvage property acquired by exercising those rights) at entity-specific value if insurance liabilities are measured at entity-specific value, and at fair value if insurance liabilities are measured at fair value.

Principle 4.10 - Provisions for catastrophes and equalisation

An insurer should not recognise catastrophe provisions relating to possible future claims beyond the end of the contracts included in the closed book. Similarly, an insurer should not recognise equalisation provisions to cover random fluctuations of claim expenses around the expected value of claims.

Principle 4.11 - Acquisition costs

Acquisition costs should be recognised as an expense when they are incurred.

Chapter 5: Adjustments for risk and uncertainty

Principle 5.1 - Risk and uncertainty

The entity-specific value and fair value of insurance liabilities and insurance assets should always reflect risk and uncertainty.

Principle 5.2 - Where should risk and uncertainty be reflected

Adjustments for risk and uncertainty should be reflected preferably in the cash flows, or alternatively in the discount rate(s), without any double counting.

Principle 5.3 - Risk preferences

Estimates of both entity-specific value and fair value should reflect the market's risk preferences, inferred, as far as possible, from observable market data. Inferences about the market's risk preferences should be determined using a consistent methodology over time. Changes in the inferred level of risk preferences should be made only in response to observable market data.

Principle 5.4 - Diversifiable and undiversifiable risks

The entity-specific value or fair value of an insurance liability or insurance asset should always reflect both diversifiable and undiversifiable risk.

Principle 5.5 - Unit of account

Measurement of insurance contracts should focus on books of insurance contracts that are subject to substantially the same risks, rather than on individual insurance contracts. Measurement of the book of contracts should reflect all benefits of diversification and correlation within that book of contracts (to the extent that they are readily determinable), but should not reflect the benefits of diversification and correlation outside that book of contracts.

Principle 5.6 - Options and guarantees contained in insurance liabilities and insurance assets

Option pricing models should be used to measure options and guarantees contained in insurance contracts.

Principle 5.7 - Reliability

In the exceptional cases when no reliable estimate can be made of the market value margin at initial recognition of an insurance liability or insurance asset, an insurer should set the market value margin at a level that leads to no net underwriting profit or loss from the contract, until a reliable estimate of the market value margin becomes possible.

Principle 5.8 - Illiquidity and market imperfections

Both fair value and entity-specific value should exclude the effect of illiquidity and market imperfections, unless there is persuasive evidence that enables these items to be quantified by reference to observable market data.

Principle 5.9 - Foreign currency risk

When all the future cash inflows and outflows from an insurance contract are denominated in a single foreign currency, the entity-specific value and fair value of that insurance contract should not reflect foreign currency risk arising from the possibility of future changes in the foreign exchange rate for that currency (consistent with IAS 21, The Effects of Changes in Foreign Exchange Rates). When future cash flows are in more than one currency, or where the policyholder can choose the currency in which premiums or benefits are paid, at a pre-determined exchange rate, entity-specific value and fair value should reflect the resulting foreign exchange risk.

Chapter 6: Discount rates

Principle 6.1

The starting point for determining the discount rate for insurance liabilities and insurance assets should be the pre-tax market yield at the balance sheet date on risk-free assets. That starting point should be adjusted to reflect risks not reflected in the cash flows from the insurance contracts. The currency and timing of the cash flows from the risk-free assets should be consistent with the currency and timing of the cash flows from the insurance contracts. Risk-free assets are those assets with readily observable market prices whose cash flows are least variable for a given maturity and currency.

Principle 6.2 - Foreign Currency Cash Flows

Estimated cash flows in foreign currency should be discounted using the appropriate discount rate for the foreign currency. The resulting present value should be translated into the measurement currency using the spot rate at the reporting date.

Chapter 7: Performance linked contracts

To be completed

Chapter 8: Reinsurance

Principle 8.1 - Accounting by Reinsurers and Cedants

A reinsurance contract should be defined as an insurance contract issued by one insurer (the reinsurer) to indemnify another insurer (the cedant) against losses on an insurance contract issued by the cedant.

Principle 8.2 – Accounting by reinsurers and cedants

Reinsurers and cedants should apply all the recognition, derecognition and measurement requirements in Principles 2.1-7.6 to all reinsurance contracts.

Principle 8.3 - Gross Presentation for Reinsurance

If a reinsurance transaction does not qualify for derecognition of the related direct insurance liability under principle 2.3, a cedant should present:

- **a.** an insurance asset arising under reinsurance contracts as an asset, rather than as a deduction in measuring the related direct insurance liability; and
- **b.** reinsurance premiums as an expense and the reinsurer's share of claims expense as income.

Chapter 9: Measurement of direct insurance contracts by policyholders

Principle 9.1

A policyholder should apply principles 3.1-7.6 in measuring its contractual rights and obligations under a direct insurance contract.

Chapter 10: Other assets and liabilities

Principle 10.1 - Property

An entity whose primary business is issuing insurance contracts should measure its:

- **a.** investment property using the fair value model in IAS 40, Investment Property; and
- **b.** owner-occupied property using the allowed alternative treatment in IAS 16, Property, Plant and Equipment.

Principle 10.2 - Deferred Tax

An entity whose primary business is issuing insurance contracts should use discounting in measuring its deferred tax assets and deferred tax liabilities.

Chapter 11: Reporting entity and consolidation

Principle 11.1 – Separate statutory funds

The insurer, comprising both policyholder and shareholder interests, is a single reporting entity which should prepare a single set of financial statements. In consequence:

a. the insurer's financial statements should include the assets, liabilities, income and expenses of any separate statutory funds associated with its insurance contracts; and

b. the effect of transactions between separate policyholder funds of an insurer should not be recognised in the financial statements as assets, liabilities, income or expenses. Income and expense from transactions between policyholder funds and shareholder funds should be eliminated. However, where such transactions affect the relative interests of policyholders and shareholders in the assets held in the respective funds, the effect of such transactions should not be eliminated in determining the balance sheet effect.

Principle 11.2 - Transferee accounting for a block of insurance contracts

An insurer should not recognise goodwill when it acquires a block of insurance contracts in a transaction that is not a business combination as defined in IAS22, Business Combinations. The insurer should recognise any difference between the entity-specific value of fair value of the block of contracts at the transaction date and the amount paid as income or expense in the income statement.

Principle 11.3 - Horizontal groups

The Standard should not prescribe whether a horizontal group that includes an insurer should prepare combined financial statements covering all the entities under unified management.

Chapter 12: Interim Financial Reports

Principle 12.1

The Standard should not contain guidance on the application of IAS 34, Interim Financial Reporting, to insurance contracts.

C Overview of asset model

Introduction

Financial economists have proposed a modelling framework that projects forward and evaluates future cash flows consistently with the observable market prices. The development of these "market consistent" models started in 1973 with the famous Black and Scholes option pricing paper and such models are used widely in the financial services industry for pricing and hedging purposes. Contingent claims pricing often forms the basis of the financial economic models.

A financial economic asset model

The model described below has been developed within the Insurance and Financial services practice at Watson Wyatt.

Key elements of the model

The output from the model consists of stochastic simulations of future prices and cash flows for each of the modelled assets. The model can in principle accommodate an unlimited number of assets and economies (currencies), but for the purpose of this SIAS paper we have only used one economy (UK) and two asset classes (bonds and equities).

The statistical distributions of all asset prices are based on the lognormal distribution. The lognormal distribution is the default distribution for risky assets in many financial economic models.

The term structure model

The term structure evolution in the model is based on the Heath Jarrow Morton (HJM) (1992) framework. The HJM framework is the most general of the so-called no arbitrage term structure models. No-arbitrage models take the current spot (e.g. GBP, dividend, property) yield curve in the market as a starting point. From this spot yield curve HJM derives the implied forward curve and then projects all forwards rates in the curve simultaneously in an arbitrage free way. The future forward rates are assumed to be normally distributed and affected by one source of uncertainty only. Each forward rate has its own volatility which give rise to a whole term structure of volatilities. The volatility term structure declines exponentially as the maturity of the implied forward rate increases.

Deflators

The central building block of the model is the notion of a state price deflator process. Alongside the evolution of each asset in the model a corresponding state price deflator (or in short: deflator) is projected. A deflator is a mechanism for transforming real world asset evolutions to their risk neutral equivalent. In other words deflators cancel any risk premia in the evolution of risky assets. At the same time the deflator also acts as a discount mechanism. The overall effect is that deflators can be likened to 'stochastic' discount factors.

Deflators form part of the output of the asset model. In addition to the set of deflators for each currency in the model, deflators are also defined for each risky asset in the model, like equities or property. As it turns out asset prices can be defined as the ratio of the deflators of the

respective assets. The deflators are therefore the central link between the different assets in the model.

Calibration of the model

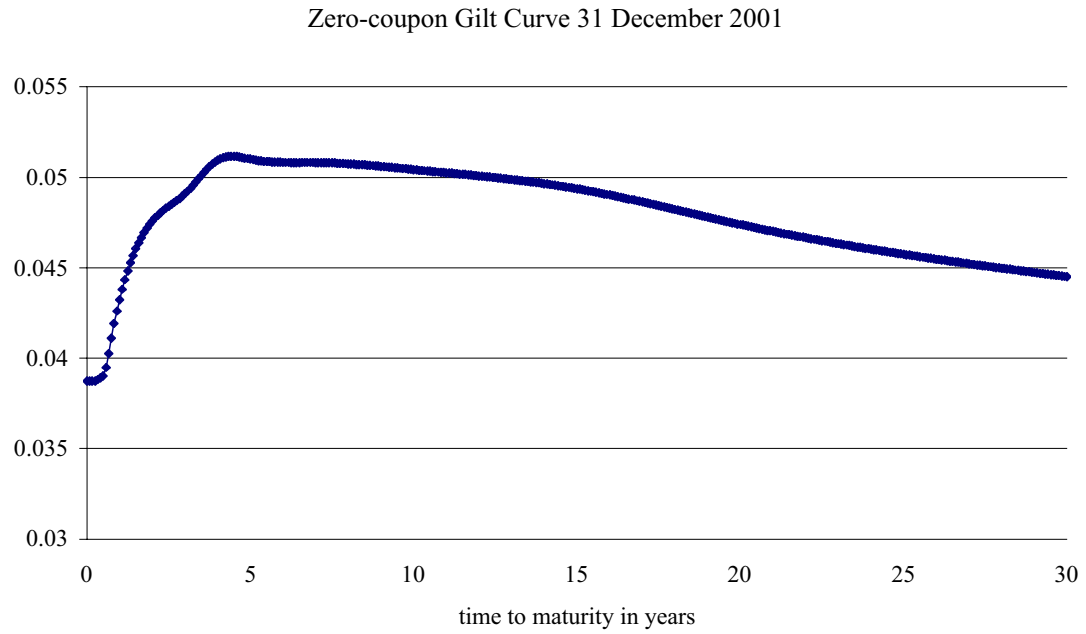
The model was calibrated to the UK economy at 31 December 2001.

The calibration process of the model takes place in two stages.

First the term structures are calibrated. As far as possible the yield curves and the parameters that describe the volatility of yields are fitted to market data . Inevitably some assumptions also need to be made.

Yield curves

The interest model has been fitted to the following fair market curve for gilts at 31/12/2001.



Source: Bloomberg

The starting dividend yield curve was assumed to be flat at a level of 2.8%, equal to the instantaneous dividend yield of the FTSE 100 at 31 December 2001.

Yield volatilities

The Heath Jarrow Morton volatility parameters for the interest yield curve movements were calibrated to quoted swaption volatilities at the year end of 2001. The resulting short rate volatility was 108bp and a speed of mean reversion of 4.63%.

The dividend yield parameters were calibrated to historic dividend yield volatility of the FTSE 100. The resulting short rate volatility was 34bp with speed of mean reversion 1.03%.

Total return and correlations

The second stage involves calibrating the correlations between the different stochastic drivers in

the model and the market prices of risk for each asset. These parameters are calibrated to the risk premia, volatilities and correlations of asset prices that we derived as far as possible from market data.

The equity total return was calibrated to reflect a risk premium of 3% and a volatility of 20%.

D References

On fair value accounting:

International Accounting Standards Board (2001/2) *Draft statement of principles.* Available at http://www.iasc.org.uk/cmt/0001.asp?s=410776&sc={DB22EF52-D704-4FDF-9F5B-A1A900840034}&n=1001#DSOP

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The three papers above were presented to the Bowles seminar (2001) and are available at request from achamberlain@gsu.edu

On state price deflators:

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Any errors are ours and ours alone.

Michel Abbink/Matt Saker (February 2002)