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# Realistic liabilities and risk capital margins for with-profits business

A Discussion Paper

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**Presented to the Institute of Actuaries, 24 November 2003**

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# 1. INTRODUCTION

1.1 Over the last two years the focus of with-profits regulation has changed fundamentally. Starting with the first “Dear CEO” letter sent in August 2002 and culminating in the recent CP195 proposals we have seen a move from the traditional valuation approach to perhaps the most advanced mark-to-market regime of any industry, anywhere in the world. Few saw this change coming and, even after its announcement, it was not clear what it would mean in practice. The results of the calculations to date have surprised many actuaries, and may even have surprised the regulators who requested them.

1.2 We were prompted to write this paper by the belief that the proposals for realistic reporting for with-profit business, codified within CP195, have not, to date, had widespread discussion within the actuarial profession and the profession as a whole appears to have had little opportunity to influence their development. A working party chaired by David Hare under the auspices of the Life Research Board, to which one of us has had the opportunity to contribute, is considering the issue of realistic prudential reporting more generally and has recently produced a paper entitled “The realistic reporting of with-profits business”. We hope to complement this effort by focusing on two or three areas which we consider particularly important. We hope that the discussion following these papers will allow actuaries to make an important contribution to the debate.

1.3 This paper addresses some of the practical and theoretical issues raised by the move to a market-consistent calculation of realistic liabilities and solvency capital for with-profit business. It is not concerned with ICAS, which is also covered by CP195. In regulatory terms we are addressing Pillar 1, not Pillars 2 or 3 of the Basle regime.

1.4 We are broadly supportive of the change in approach, and believe it is more appropriate to both the regulation and management of with-profits offices. However, we have some concerns with the detailed reporting requirements and certain aspects of the regulations set out in CP195. This paper sets out some of our concerns and, where appropriate, proposes possible alternatives.

1.5 The structure of the paper is as follows. First, we give a brief overview of the proposals set out in CP195 as they relate to Pillar 1. As CP195 is over 300 pages in length, our summary cannot explore the full complexity of the proposals and we recommend a reading of the original documentation.

1.6 We then address a number of fundamental issues on which we hope this paper will stimulate discussion:

- (1) Is the “twin peaks” approach, as set out in CP195, appropriate for the prudential supervision of with-profits business? In particular, are asset shares and the market consistent value of guarantees an appropriate basis for measuring the liability to policyholders?
- (2) What are the key issues in calculating realistic liabilities and the risk capital margin?
- (3) What allowance should be made for future management actions in calculating both the basic realistic liabilities and, more importantly, the associated stress tests? How can these actions best be incorporated within the calculations?

1.7 There is a presumption within CP195 that a market-consistent calculation of realistic liabilities (defined in Appendix A) is a natural starting point for regulatory reporting. However the rationale for this approach has not been fully explained in CP195. Depending upon the rationale, different conclusions may be reached about the most appropriate calculation approaches, for example around the treatment of taxation. Hare et al discuss a possible rationale for the use of market-consistent valuation as a basis for prudential reporting. We have adopted a similar rationale, summarised later in this paper, to guide our discussions. If the FSA has come from a different viewpoint we trust that this will become clear.

1.8 Throughout this paper we illustrate our discussions by reference to a hypothetical with-profits office. This has been constructed to be representative of a ‘typical’ office and is not meant to be representative of any particular office. Details are given in Appendix B.

1.9 We are grateful to many of our colleagues who helped in the preparation of this paper, in particular Martin Bradley, Gavin Palmer and Peter Wright, who have made valuable comments, and Rob Ashbolt and Siao Wearn Leong who assisted with the modelling. Their efforts have improved it. As always, any errors remain our own, the views expressed are our own and not those of our employer or any professional working parties or committees on which we have served.

## 2. THE “TWIN PEAKS” APPROACH

### 2.1 Background

2.1.1 The genesis of CP195 and the “twin peaks” approach came from two sources. First, as expressed in speeches made by Sir Howard Davies and John Tiner, the FSA had a general dissatisfaction with some elements of the traditional valuation approach. Specifically,

- The implicit allowance for future reversionary bonuses and expenses within the net premium valuation approach for conventional with-profit business, coupled generally with the margins in the valuation, made it difficult to assess how prudent (or not) the mathematical reserves were. In conjunction with the EU solvency margin requirements this approach could lead to “margins upon margins”, overstating the provisions required.
- The valuation made little allowance for the time value<sup>1</sup> of embedded options. Any value included was a by-product of the interaction between the resilience test and limits on the reinvestment rate, but this could produce very different results from a proper hedging calculation based on market prices.
- The valuation made no explicit allowance for future terminal bonuses.

Second, the stock-market falls in 2001 and 2002 gave rise to a concern that mathematical reserves were not reacting to falls in the markets appropriately. That is, the rigidity of the net premium valuation did not allow liabilities to reflect the changes in future bonus rates that market falls would engender. It was felt that this might lead to an understatement of capital available in extreme circumstances and hence cause offices to sell equities unnecessarily.

2.1.2 Section 2.16 of CP195 clearly sets out the regulatory regime that the FSA was, and is, seeking. Realistic liabilities should equal:

- “A realistic present value of expected future contractual liabilities, plus
- A realistic present value of projected ‘fair’ discretionary bonus payments.”

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<sup>1</sup> The value of any option can be split into two elements. The intrinsic value is broadly the value given current market levels and (risk free) deterministic future experience. The time value is the additional value due to possible future fluctuations in market levels.

2.1.3 The remainder of CP195 makes it clear that “realistic” should be interpreted to mean consistent with the market prices of similar traded assets. In carrying out such a calculation, we would generally expect a realistic present value of future contractual benefits to be relatively insensitive to the performance of the assets actually held, as the payments are essentially fixed. As such, the present value should reflect the cost of hedging with essentially risk free bonds or similar instruments. One exception would be the cost of any reserve for guaranteed annuity options (GAOs) on contractual benefits, which would reflect prices of hedging instruments available in the interest rate derivative market.

2.1.4 On the other hand, we would expect the present value of future discretionary benefits to vary significantly with underlying asset values, reflecting the strong link between bonuses paid in the future and any investment profits and losses. As such, any provisions held should vary with market levels and to the extent that companies have been backing reserves for guaranteed benefits with equities and properties, should be heavily geared.

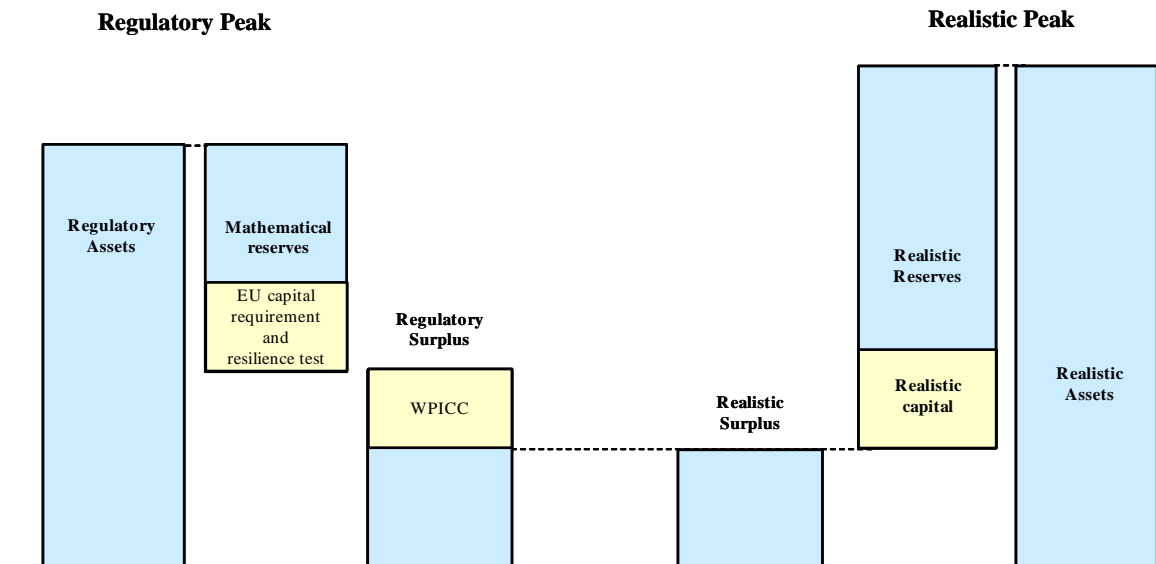
2.1.5 The approach suggested in CP195, to split the realistic liabilities between the contractual and discretionary components, appears to be a positive move forwards. However, the draft rules in the appendix to CP195 do not, in fact, reflect this objective.

## 2.2 The European Life directive

2.2.1 That the regulations set out in CP195 diverge from the FSA’s clear objectives, as presented in CP195 is, at least in part, due to the constraints of the European Life Directive. This sets out rules for the calculation of regulatory liabilities (“mathematical reserves”) that individual country regulators have limited powers to vary.

2.2.2 To meet these rules whilst incorporating their preferred regulatory approach the FSA has introduced the so called “twin peaks” approach. This effectively sets the total reserves and capital required as the greater of that required under a (much weakened) statutory approach and that required under a realistic, market-consistent approach.

2.2.3 To implement this approach the FSA has relied upon the ability of local regulators to set capital requirements in excess of EU minima. The FSA has defined an additional capital requirement, as set out in the diagram below, known as the with-profits insurance capital component (WPICC), which is effectively the additional capital required to bring the regulatory surplus down to the level of the realistic surplus.



## 2.3 The Regulatory peak

2.3.1 EU rules govern the calculation of the regulatory peak. However much of the purpose of introducing realistic reporting (to give a stronger link between asset values and provisions) will be lost if the regulatory peak is artificially strong. To this end the FSA has relaxed the calculation of mathematical reserves and capital. According to paragraph 3.54

“The affect of [these changes] would be for mathematical reserves to represent a prudent actuarial assessment of contractual benefits. Expected discretionary bonus payments would be separately assessed and explicitly reserved for, under the realistic peak, instead.”

2.3.2 In our view this split makes good sense; it will clarify the extent to which assets are available to pay discretionary benefits, if at all, and will help in considering the appropriate investment policy. Further, it is consistent with the move to greater transparency in the operation of with profit funds.

2.3.3 The changes to the calculation of mathematical reserves referred to above are broadly as follows:

- A gross premium rather than a net premium approach can be used;
- Much of the prudence in setting the rate to discount future cash flows is removed;
- GAOs on existing benefits must be valued on a market-consistent basis;

- A prudent allowance for future lapses is allowed; and
- The resilience reserve has been deemed an element of capital rather than a reserve.

2.3.4 However, the draft rules within CP195 do not fully reflect the changes set out above. Instead, the rules require an explicit allowance to be made for future reversionary bonuses in calculating the mathematical reserves. This may have arisen from the FSA's interpretation of the EU requirements.

2.3.5 In our view the proposed approach (i.e. the approach set out in the rules rather than the discussion in CP195) has two disadvantages. First, it blurs the distinction between contractual and discretionary benefits set out above. Second, and more importantly, an over-strong regulatory peak potentially makes the "twin peaks" approach a one-sided tool. It allows for stronger overall capital requirements, where appropriate, but does not give the flexibility for reserves to respond to falling asset values (one of the original reasons for this new approach). If possible, we suggest the FSA remove this requirement.

2.3.6 It should be noted that, even without the inclusion of an allowance for future reversionary bonuses, mathematical reserves as defined in CP195 would not be precisely equal to a realistic value of contractual benefits. For example the EU directive requires margins for adverse deviations and sets a required minimum capital margin. Nevertheless, for all practical purposes they should be sufficiently similar for the regulatory peak to be used as a reserve for contractual benefits (on an essentially market-consistent basis), allowing the WPICC to be defined as the additional reserve and capital, if any, required for discretionary benefits.



## 2.4 The Realistic Peak

2.4.1 The realistic peak sets out a calculation of realistic liabilities. That is, a valuation of all payments from the fund associated with the current generation of in-force policyholders, on a basis that should be consistent with the prices of traded assets. We discuss the calculation and analysis of this figure later in this paper.

2.4.2 The table below sets out the main reporting required by CP195 for the realistic peak (it is a précis of the proposed form 19) as it relates to the realistic assets and liabilities of the fund. We have adopted the so-called “asset share” approach, which is discussed further below, and applied it to our hypothetical company.

2.4.3 The realistic balance sheet is essentially split into three important items: the realistic value of assets available to support with-profit business (after deducting, the assets required to cover the reserves and solvency capital of the non-profit liabilities in the with-profit fund), the with-profits benefit reserve and future policy related liabilities. It is immediately noticeable that nowhere is there an item equivalent to the value of contractual benefits. That is, the realistic balance sheet does not implement the split of liabilities envisaged in the discussion in CP195.

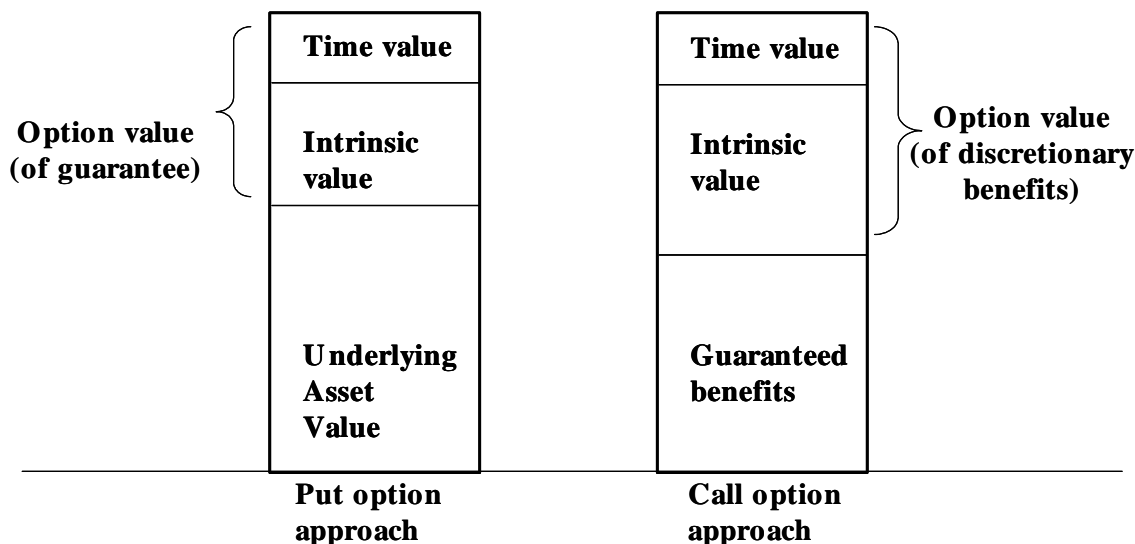
**TABLE 2.1 – PRESENTATION OF REALISTIC BALANCE SHEET**

<b>Realistic value of assets of fund</b>	
	£ million
Long-term admissible assets for fund	7,200
Mathematical reserves in respect of non-profit business	(1,199)
Admissible assets covering long-term insurance capital requirement for non-profit	(50)
Admissible assets covering resilience capital requirement for non-profit	-
Total admissible assets backing non-profit business	(1,249)
Total admissible assets in fund in excess of market and counterparty limits	-
Value of future profits (or losses) on non-profit business	65
Realistic value of assets of fund	6,016
<b>Realistic value of liabilities of fund</b>	
With-profits benefits reserve	4,698
Past miscellaneous surplus attributed to with-profits benefits reserve	-
Past miscellaneous deficit attributed to with-profits benefits reserve	(-)
Planned enhancements to with-profits benefits reserve	-
Planned deductions for guarantees, options and smoothing	(-)
Planned deductions for other costs chargeable to with-profits benefits reserve	(151)
Future costs of contractual guarantees (other than financial options)	670
Future costs of non-contractual commitments	-
Future costs of financial options	375
Future costs of smoothing	36
Financing costs	-
Any other long-term insurance liabilities	51
Total	5,679
Realistic current liabilities	-
Realistic value of liabilities of fund	5,679
Working capital for fund	337

2.4.4 The planned deduction of £151m relates to charges on unitised with-profit contracts, less expenses. The contractual guarantees of £670m represent the basic policy guarantees, while the financial options of £375m represent the cost of guaranteed annuity options (GAOs). The £36m cost of smoothing is made up of a £42 million “glide path”, cost (assuming payouts are based on unsmoothed asset shares) together with a reduction of £6m due to the long-term effect of smoothing payouts. The other long term insurance liabilities of £51m consists of tax on shareholder transfers which is charged to the estate. These results are consistent with our experience to date of companies with similar guarantees and equity backing ratios of around 50%.

## 2.5 Alternative valuation approaches for realistic liabilities

To understand what is actually shown in the realistic balance sheet, it is important to note that there are generally two equivalent approaches to valuing any liability that exhibits optionality. These are referred to as the “put option approach” and “the call option approach”. The differences are set out diagrammatically below.



### *Put option approach*

2.5.1 CP195 adopts the put option approach, which defines a liability as equal to the value of some underlying asset plus an additional option value which reflects the fact that payments will never fall below a certain minimum value.

2.5.2 In with-profits terms the underlying asset is invariably equated with the asset share while the level of guaranteed contractual benefits defines the minimum payments. In the realistic balance sheet shown above, the “with-profits benefit reserve” is the asset share while the “future policy related liabilities” represent the values of potential payments above asset share.

2.5.3 The advantage of this approach is that if the underlying asset (e.g. asset share) is traded no valuation calculation is required for this element of the liability, as the market asset value can be used. However, for with-profits business this assumption is only valid if management’s intention is to pay 100% of unsmoothed asset share in all cases, except where guarantees bite. In general, this is not the case and further calculations are required, for example of the cost of smoothing. For companies basing payouts on smoothed asset share, the cost of smoothing effectively bridges the gap between the

market value of unsmoothed asset share and the (unobservable) market value of smoothed asset share.

2.5.4 The disadvantage of the “put option” approach is that it does not show the value of contractual benefits. It also places (in our view) undue attention on the unadjusted asset share. We are particularly concerned that this could give unsmoothed asset shares, particularly individual unsmoothed asset shares, the position of a de facto standard that with-profit companies are expected to pay, in all circumstances, subject to guarantees. We do not believe this represents the basis upon which most with-profit business was written.

2.5.5 Asset shares are but one, albeit important, element influencing bonus decisions. Bonus rates will also allow for smoothing and past history, and will generally be set at a much broader group level. In some circumstances bonuses will be based on scales derived from entirely different contracts, e.g. whole life policies often pay bonuses based on endowment terminal bonus scales. As recent events have shown, the level of bonuses declared will also be influenced by the cost of guarantees, and the overall solvency position of the office.

### ***Call option approach***

2.5.6 An alternative is the call option approach, where the realistic liability is split into two parts: the value of guaranteed contractual benefits plus an option value reflecting the fact that in certain circumstances additional payments will be made, i.e. discretionary bonuses paid.

2.5.7 The split between contractual and discretionary benefits is an important one for management, regulatory and policyholder understanding. We would expect the regulator (among others) to be more concerned over an inability to meet contractual benefits than discretionary benefits. We would expect (and hope) that management would act differently e.g. in terms of asset matching policy towards these two items. We believe their presentation separately highlights the difference in treatment that policyholders can expect and as such enhances transparency. We also believe that the calculation of guaranteed benefits has less scope for subjectivity than the future discretionary benefits.

2.5.8 The table below provides an alternative presentation of the realistic liabilities of our example company based upon the call option approach.

**TABLE 2.2****Presentation of realistic liabilities – call option approach**

	£m
Basic contractual benefits	4,767
Planned deductions for charges, less expenses	(151)
GAOs on contractual benefits	325
Total contractual benefits (A)	4,941
Future discretionary benefits (bonuses)	652
GAOs on future discretionary benefits	50
Cost of smoothing	36
Total future discretionary benefits (B)	738
Realistic value of liabilities (A)+(B)	5,679

2.5.9 This approach reveals that around 85% of the liabilities are in respect of contractual benefits and associated GAOs. These benefits are not amenable to modification via changes in management action and, importantly, do not vary significantly with changes in asset values. Only £738m of the liabilities are related to future bonuses. Management discretion might, in extreme circumstances reduce this to zero, but no more. The majority of liabilities are essentially non-profit in nature and this should immediately cast suspicion on the appropriateness of the 50% EBR adopted by our hypothetical fund.

2.5.10 We can compare the liability figures to the current asset share of £4,698m, which is effectively the value of the monies received from policyholders to fund these benefits. This tells us that the value of contractual benefits are, in aggregate, slightly greater than the accumulated asset share, implying that even a low EBR and small future bonuses would be more than economically “fair”. Current management policy appears to grant benefits in the future (the sum of A and B in the table) worth £981m more than the current asset share, a clearly unsustainable approach in the longer term. All of this information is, we believe, of much interest to regulators, management and prospective policyholders.

2.5.11 In our experience this picture is not unusual for with-profit funds following the sharp falls in equity markets we have experienced. In general we believe most funds are

broadly “at the money” currently, with the value of asset shares and basic contractual benefits approximately equal. For more recent business the value of contractual benefits normally exceed asset shares, i.e. the guarantees are “in the money”. For some much older business the reverse is usually true.

2.5.12 This presentation also provides additional useful information to shareholders. In a 90:10 fund shareholders receive 1/9<sup>th</sup> of all future bonuses. The value of all future bonuses and smoothing, including those to shareholders but excluding attaching GAOs in which shareholders do not participate, is £688m. The shareholders 10% participation therefore has a value of approximately £69m. This information is not readily available from the proposed put option approach.

2.5.13 One issue which must be addressed is how to allow for surrenders in calculating the basic contractual benefits, as the surrender basis is usually discretionary. Two possible approaches suggest themselves. One is to assume the minimum surrender basis that the contract terms and relevant laws allow, but to also assume commensurately low lapse rates. The other is to model a realistic estimate of the actual payment on surrender. While not contractual, we believe that this second approach is more appropriate.

## 2.6 The bonus reserve valuation approach

2.6.1 CP195 does allow an alternative, bonus reserve valuation (BRV) approach, which goes some way to addressing some of the issues set out above. This is because it defines the with-profits benefit reserve as the projected outgo including bonus payments, with asset shares being just one driver of these payments.

2.6.2 There is, however, a presentational difficulty with the BRV approach in that the with-profits benefit reserve under this approach will include the intrinsic value of any embedded options. As such the breakdown of figures calculated using the BRV approach will not be comparable to those calculated using the asset share approach.

2.6.3 The table below, which presents an extract from the realistic liabilities set out in the proposed new form 19, shows this difference clearly for our example firm.

**TABLE 2.3****Comparison of realistic liabilities under the asset share and BRV approaches**

	<b>Asset Share Approach</b>	<b>BRV approach</b>
With-profit benefit reserve	4,698	5,379
Planned future deductions	(151)	-
Future cost of contractual guarantees	670	236
Future cost of financial guarantees	375	70
Future costs of smoothing	36	(6)
Other long term liabilities	51	-
Realistic liabilities	5,679	5,679

Under the BRV approach the with-profit benefit reserve includes a number of items that were shown separately. These include the intrinsic cost of the basic guarantees, GAOs and smoothing costs. Only the time values are shown as costs of guarantees and smoothing. It is interesting to note that the time value of the GAOs is small, reflecting how deeply in the money the GAOs are. The BRV also includes tax on shareholder transfers, charges and investment expenses.

2.6.4 Importantly however, the BRV approach goes no further than the asset share approach in identifying the “non-profit” nature of the liabilities.

## 2.7 The way forward?

2.7.1 We are not sure why the “call option” approach, reflecting the discussion set out in CP195, is not reflected in the proposed rules. Possibly the discussion in CP195 reflects the better understanding the FSA has developed following the receipt of information following the original “Dear CEO” requests. Possibly it also reflects the historic development of the asset share approach within the industry. However, a brief recap of developments in the financial management of with-profits business suggests why the approach may no longer be optimum in today’s economic environment.

2.7.2 In the late 1980s and early 1990s, many companies developed asset shares to assist in their bonus decisions. However, their use was generally limited to calculations on sample policies to help determine broad equity between different types of policies and contracts of different terms in setting terminal bonus rates.

2.7.3 Some companies then began to calculate aggregate asset shares as a measure of their realistic liabilities – this was particularly helpful for UWP contracts with flexible premiums, where broader based bonus reserve valuation techniques are difficult to apply. Asset shares were also used as a measure of realistic liabilities, and to determine the size of the estate, in many of the demutualisations and reconstructions of with-profit funds which took place in the 1990s, and were increasingly used in the financial management of their with-profits business during this period.

2.7.4 A long period of very high equity returns and relatively high interest rates ensured that asset shares at this time were, for most of the business, well in excess of the underlying value of the guarantees in with-profit policies. It was assumed that any costs of guarantees would be met from the estate or attributed, as a part of the miscellaneous profits and losses, across all with-profit policies.

2.7.5 However, as interest rates fell sharply during the 1990s and as a result of the very poor stock market returns of the last few years, it is clear that for many companies the guarantees are now a much more important component of the liabilities. At the current time, guarantees exceed asset shares for most life policies of durations less than 15 years, and, for those pensions contracts with GAOs, at virtually all terms.

2.7.6 On a market consistent basis, the value of guaranteed benefits now account for at least 75% of the total liabilities of most with-profit offices and, in some cases, in excess of 90%. In this situation it appears more appropriate to adopt a valuation approach and presentation that focuses first and foremost on the guaranteed benefits and only then on the residual available to pay discretionary benefits.

2.7.7 Given the above, the FSA may wish to consider the merits of the alternative “call-option” approach outlined in Section 2.5. If the value of guaranteed benefits was deemed sufficiently close to the regulatory peak this approach would effectively result in a “single peak” which would be a simplification of the current proposals and a major step forward. In our view such an approach would be easier to calculate, easier to explain and of more use to both the regulators and management in the financial management of their with profit funds.

2.7.8 One potential drawback of this approach is that the aggregate asset share is no longer identifiable from the realistic balance sheet. This could be addressed by disclosing this information as a footnote, or perhaps more appropriately, splitting the assets into the aggregate asset share and a residual item.



## 2.8 Non-profit business

2.8.1 The treatment of non-profit business is also a difficult and potentially contentious area. The FSA has adopted the pragmatic approach of allowing the non-profit business within a with-profits fund to be valued on an embedded value basis for the purposes of the realistic peak. However this introduces certain anomalies.

2.8.2 Firstly, there is a clear inconsistency between the value which may be attributed, for regulatory reporting purposes, to with-profits business written within a with-profit fund (assuming it is the realistic peak rather than the regulatory peak which bites), and that which applies for the same business written in a non-profit fund or subsidiary. This substantially reduces the capital requirements for non-profit business written in a with-profits fund as new business strain is effectively eliminated, (the value of in-force will be equal to or greater than the initial loss provided that such business is profitable). Of course, there will still be a solvency margin requirement.

2.8.3 Secondly, there is an inconsistency between the treatment of non-profit business and the treatment of with-profit business within the same fund, as the latter is to be valued on a market consistent basis. For protection business this is probably not too important as the value attributed is likely to be an underestimate compared with a market consistent basis. Similarly, for unit linked business the embedded value is likely to be close to or below a market consistent value.

2.8.4 However many with-profits funds include significant blocks of immediate annuity business for which the embedded value may be higher than the value on a fully market consistent basis – which could result in an over-estimation of the assets available to support discretionary benefits.

2.8.5 There would seem to be a case for treating non-profit business in a similar manner to other business in a with-profit fund, as in practice the fund will be managed as a whole. A possible move in this direction would be to ensure that the embedded value of non-profit business is included in the stress scenarios when determining the level of risk capital margin.

### 3. CALCULATING THE VALUE OF GUARANTEES AND OPTIONS

#### 3.1 Introduction

3.1.1 Regardless of presentation, a number of technical issues can significantly affect the results of a market-consistent valuation. The calculation of the cost of guarantees and options is the most difficult of these. We have concentrated on the areas of valuation approach, choice of asset model, calibration and allowance for tax, which in practice seem to cause most concern.

#### 3.2 Valuation approaches

3.2.1 CP195 gives a choice of methods to use when calculating option and guarantee costs. It sets out a clear preference for market-consistent approaches, either by direct comparison to market prices or the use of stochastic modelling techniques. In general it states that stochastic modelling is likely to be more appropriate as there are few traded instruments that are a good match for the options within with-profits business (other than GAOs). We agree with this analysis but believe that its implications are open to mis-interpretation. In particular, the difference between stochastic and simulation approaches is often misunderstood.

3.2.2 The Black-Scholes option pricing formula and its ilk are actually stochastic models. They assume that the assets under consideration evolve under a lognormal (or other as appropriate) distribution and value the option as the discounted mathematical expectation of the payout under a particular probability distribution, the so called “martingale measure”. Formulae such as those for put and call options arise when it is possible to solve the stochastic differential equations representing the model.

3.2.3 When such solutions are not available, numerical methods must be used to find solutions. One (generally the most inefficient) of those is Monte Carlo simulation. However simulation is simply one technique for implementing a stochastic approach, with its own strengths and weaknesses. Simulation is not a synonym for stochastic modelling.

3.2.4 Hence approaches such as the Black-Scholes formula should be classified as stochastic models, rather than as deterministic or market price approaches. They give the same results as an equivalent simulation, but without introducing the sampling error. As

such – where appropriate to the guarantees being modelled – they should be at least as acceptable as simulation approaches.

3.2.5 Few with-profits guarantees can be modelled exactly using such formulae.

However it is our experience to date that the simplifying assumptions made in carrying out realistic reserve calculations often reduce the payouts modelled to those which can be adequately valued using such formulae. They provide a useful tool and should not be dismissed.

3.2.6 CP195 does mention a third method, based upon a series of probability weighted stress tests, but makes clear the FSA’s preference for market-consistent approaches. We concur.

### 3.3 Choosing an asset model

3.3.1 There are many different asset models which have been developed by academics and practitioners that are available in the public domain. In addition there are various proprietary models that banks and consultants have developed. The question arises as to whether there is a “correct” or “best” model?

3.3.2 To answer this question requires an understanding of how such models are used in practice. No existing model of which we are aware is sufficiently accurate to price assets “from the ground up” from past data, and generally they are not used that way. That is, any model which takes past data (such as historic realised equity volatilities) and attempts to price traded assets will almost certainly fail. Given the complexity of the economy compared to even the most complex model this is not a surprise.

3.3.3 In practice models are used almost as graduation formulae. They are chosen to broadly reflect the way prices are believed to evolve and then their parameters chosen to reproduce the prices of a range of traded assets. These models, with appropriate parameters, then allow interpolation or extrapolation to the prices of similar, non-traded assets.

3.3.4 Thus, very different models will produce identical prices for the assets to which they are calibrated. They will typically also compare well with each other when pricing assets or liabilities which are “close” to those to which they are calibrated. Models will diverge when they are applied to situations a long way from their calibration set, or when they are poorly calibrated in the first place.

3.3.5 The issue is therefore not whether a model is “right” but whether it calibrates well, whether it can calibrate to a wide range of assets simultaneously, whether an appropriate calibration set has been chosen and so on.

3.3.6 Our experience supports the idea that calibration is more important than the model chosen, that reasonably simple models can give results in line with more complex models, and that no single model (or calibration) is suitable for all situations.

### 3.4 Calibrating models

3.4.1 Given the above, the assets chosen and calibration approach adopted are crucial to the reliability of any market-consistent valuation. CP195 makes it clear that a market-consistent valuation should be consistent with the traded prices of equity and interest rate options similar to those that could be used to hedge the liabilities of a with-profits fund. In deciding precisely how to calibrate our models, we should therefore look at what assets are appropriate and how such options are priced.

#### ***The “risk free” rate***

3.4.2 Although CP195 suggests that gilt rates form an appropriate basis for mathematical reserves it makes no comment on the appropriate discount rate for the realistic valuation. To be market-consistent, a “risk free” discount rate is required which incorporates the market term structure at the valuation date. It is common practice in the capital markets to use a risk free rate derived from swap rates. Swap rates can be thought of as representing the (essentially risk free) rate at which high credit quality institutions can borrow or lend, providing they maintain their credit quality. The swap market is the largest and most liquid of all fixed interest markets, far outstripping the size of the gilt market.

3.4.3 There is a debate among actuaries as to whether gilts or swaps are the most appropriate benchmark for the risk free rate. The use of a swap-based risk free rate would probably not be the starting point for all actuaries. However, for both theoretical and practical reasons we believe that market-consistent models should be calibrated to the swap curve. Perhaps the most compelling reason is that this assumption is behind the pricing of most derivative instruments. If another assumption is made, the results are unlikely to be consistent with these markets.

3.4.4 Use of swap rates typically gives a risk-free rate of the order of 20-30bp above gilts. This difference has little effect on values in the absence of guarantees but reduces the cost of embedded options to an amount consistent with traded market prices. Bloomberg and other publicly available data sources provide reliable swap rate data. Given the importance of this assumption, we believe that a good calibration should fit the swap curve exactly i.e. reproduce the price of all swaps quoted in the market.

### ***Equity volatility***

3.4.5 In general, it is only necessary to make assumptions about equity volatility when there are embedded options to value. Otherwise the risk free rate (and perhaps an inflation assumption) are sufficient for valuation purposes.

3.4.6 A market-consistent model must reproduce the prices of traded equity options. This is usually interpreted to mean fitting the implied volatility surface at the valuation date. The implied volatility is not a measure of historic volatility, but is the volatility that would need to be assumed in the Black-Scholes formula to reproduce market option prices. Using implied volatilities is equivalent, therefore, to valuing options in line with their traded prices.

3.4.7 Implied volatilities vary by both the term of the option and how in or out of the money the option is. Ideally a model will reproduce this shape, but in practice few models can be calibrated to the full volatility surface. It is, therefore, important to calibrate to an appropriate set of prices for the guarantees being valued.

3.4.8 Most with-profits insurance products have a duration of five years or more and the time value of options increases significantly with duration. Equity volatility surfaces can be obtained for terms of up to five and sometimes even ten years, although rarely longer. Fortunately, the surface appears to flatten out by this point so that it is usually appropriate to calibrate to the longer end of the surface.

3.4.9 At shorter durations there is a pronounced volatility “smile” – volatility varies with strike price. This reflects the fact that the Black-Scholes model is not a perfect representation of equity performance. However, this smile effect almost disappears at longer terms. As such it is probably not that significant for insurance business. An exception might be those companies with options extremely in or out of the money where some attempt might be made to calibrate appropriately. It should be recognised that for

deep in or out of the money options, the time value rapidly falls away, so the lack of market data may not be that significant.

### ***Interest rate volatility***

3.4.10 In a similar fashion to equity volatility, it is necessary to calibrate the volatility of interest rates (or equivalently bond options or swaptions) to the market. Interest rate volatility is important for three reasons:

- It drives the value of interest rate options, such as GAOs;
- It forms part of the asset volatility when assets include fixed interest securities rather than just equities; and
- In some asset model formulations it affects scenario specific discount rates.

3.4.11 The most common traded interest options are swaptions. Quoted prices are available for a wide range of option maturities (up to 40 years) and swap lengths (up to 30 years). The typical shape of the swaption volatility surface has a maximum at its top left hand corner and is “flat” for longer option maturities and swap lengths. Most interest rate models can be calibrated to fit the whole swaption volatility surface. Therefore the issue of picking the appropriate sub-set of calibration instruments is less pressing. However, when choices must be made, we believe that a good fit to the longer maturities and swap terms is most important for insurance valuation.

### ***Other assumptions***

3.4.12 The above represent the key assumptions required. In addition some or all of the following may be needed:

- Property volatility
- Corporate bond spreads and volatility
- Inflation and its volatility
- Dividend yields
- Correlations between assets.

In many cases market data is lacking for these assumptions and historic data must be used instead.

### 3.5 Taxation

3.5.1 As in almost any valuation, tax complicates the calculation of realistic balance sheets enormously. Unfortunately while CP195 gives no real guidance on allowing for tax, it is clear that it should be included.

#### ***Pensions and “profits” business***

3.5.2 For pensions business tax is not generally a significant issue. Asset shares roll up essentially gross of tax and it can generally be assumed that any hedging assets would also be tax free. It is therefore appropriate to value any guarantees using gross tax earned and discount rates.

3.5.3 For business taxed on profits, should any exist, a similar conclusion can be drawn. Taxation will be after any movements in reserves and, as long as reserves are on a broadly market-consistent basis, any hedging assets would not be subject to tax.

#### ***Life business***

3.5.4 For life business the situation is more difficult. The roll up of asset shares will need to include an allowance for I-E taxation. Ignoring guarantees this simply means there is another cashflow to allow for. However it complicates the valuation of options in that the underlying assets on which they are based are no longer those traded in the market but a “net of tax” derivative. This means that earned rate on the asset share must be a net rate and the volatility of return must also be net. These adjustments are easily made when using a simulation model, and can be approximated in closed-form solutions.

3.5.5 The real complexity comes in setting the discount rate<sup>2</sup>. The appropriate adjustment depends upon the interpretation of a market-consistent realistic liability value. Three different approaches are possible depending on whether we define “market-consistent” to be the cost of buying derivative protection, the cost of pursuing a dynamic matching strategy, or the value of the unhedged profits arising.

3.5.6 In pricing options, banks and other institutions do not need to allow for tax as, in general, hedging should not generate profits or losses. However, if an insurance company paying tax on I-E basis were to buy an option from a third party to hedge its liabilities, it would pay capital gains tax on the option proceeds (or income tax on the change in market value in respect of an interest rate option). This would mean that the cost of any embedded options would need to be grossed up to allow for this tax. However the discount rate used in their calculation would be gross.

3.5.7 Alternatively, if a fund operated a dynamic hedging strategy, it would incur tax costs over time rather than simply on the option maturity. This would lead to the use of a net discount rate, as losses and gains would be realised frequently as part of the rebalancing strategy.

3.5.8 Finally, if an insurance company did not hedge, but allowed mis-match costs to arise in the fund over time, a market-consistent valuation would need to allow for tax on these profits or losses. This would typically give rise to a different tax charge.

3.5.9 All three approaches require modifications to quoted option prices, but the value of the modification will differ depending upon the approach taken. If the FSA is looking for sufficient capital to allow a hedge to be put in place the first approach is most appropriate. However the latter more accurately reflects the operation of most with-profit funds.

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<sup>2</sup> While not necessarily clear from casual inspection, the Black-Scholes formula does have a specific earned and discount rate, and these rates can be different.



## 4. THE RISK CAPITAL MARGIN

### 4.1 Definition of the Risk Capital Margin

4.1.1 In addition to calculating realistic values for assets and liabilities, the FSA requires the calculation of a risk capital margin (RCM). As currently defined in CP195 this can be considered as a “realistic resilience test”. The risk capital margin is defined as the fall in realistic surplus following a specific stress scenario.

4.1.2 The current scenario includes a fall in equity and property values, a widening of credit spreads, and a parallel shift in the yield curve. The movement in the yield curve is in the direction that gives the greatest reduction in the realistic surplus. The stress test also requires a persistency shock.

4.1.3 The market movements are assumed to take place immediately, and hence no allowance can be made for mitigating action to sell assets as the market falls. However allowance can be made for subsequent management actions after the scenario has occurred.

4.1.4 Table 4.1 below shows the change in realistic liabilities for our hypothetical office. In this case the stress tests require a 10% fall in equity values and a downward shift in the yield curve. We have assumed that, following the stress scenarios, management would reduce future reversionary bonuses by 1%. We have also assumed any supplementary assets are invested in the same way as all other assets.

4.1.5 The change in the realistic liabilities is £97m. The RCM must also allow for the change in value of the supplementary assets. These fall by only 1.5% in the stress scenarios, the change in equity values being mostly offset by a rise in fixed income asset values following the downward shift in the yield curve. In total this gives a RCM of £98m and a realistic surplus of £239m.

**TABLE 4.1****Change in realistic liabilities**

	£m
(A) Realistic liabilities before stress scenarios	5,679
(B) Realistic liabilities after stress scenarios and management actions	5,776
(C) Change in realistic liabilities (B) – (A)	97

## 4.2 Rationale for the Risk Capital Margin approach

4.2.1 We believe that the combination of a realistic surplus and the type of stress test set out in CP195 is appropriate for regulatory purposes, although we have some observations about the current implementation. In our view, a market-based prudential reserving approach only makes sense in conjunction with such stress tests. This is discussed more fully in Hare et al.

4.2.2 In brief, in any scenario more favourable than the stress test, the office should have at least enough assets to cover the post scenario realistic reserves. Because these reserves are on a market consistent basis, this means the office will have enough assets to buy hedges to perfectly match its liabilities. This, albeit extreme, action should be sufficient to protect policyholders if no other solution is available. This contrasts with non-market based approaches which do not necessarily provide such a guarantee. While this makes good sense in theory, it raises a number of issues.

4.2.4 The first question is why is an instantaneous shock chosen? In theory the capital held (the risk capital margin) should be sufficient for a company to survive both a monitoring and an action period. The monitoring period is the time between measurements of realistic solvency, i.e. the time it would take management to notice a problem exists. The action period is the time it would take to put a hedge in place.

4.2.5 It would seem reasonable to assume that monitoring happens continuously (most offices monitor markets closely) but that the action time required would vary between risks and offices. For example, if an office had a policy in place of selling on a given fall, and trading instructions to implement it, a much shorter action period would be suitable. Banks often use ten trading days for hedgable market positions. On the other hand an office with no policy in place might not act for months.

4.2.6 As currently defined, requiring an instantaneous shock is equivalent to assuming offices would take no action for one year. This is because the stress scenarios are calibrated to one-year market movements. While this is clearly prudent it does seem reasonable to us that offices with automatic procedures in place to act more quickly should be allowed to reflect this when calculating their capital requirements. We recognise that any solvency rule which applies to all offices will necessarily be a blunt tool but believe that those who demonstrate good management should benefit from it. This is similar to the treatment of “own models” under the Basle capital rules.

4.2.7 A similar question arises about the size of the falls in the stress scenarios. As currently calibrated they reflect the level of asset movements over one year, not the outcome of those movements upon solvency. This will depend upon the level of matching, risk management procedures and so on. In particular, we would expect the sensitivity of liabilities to equity, property and credit spread movements to reduce to zero as the realistic assets and guaranteed liabilities converge, so that asset movements of a given size will be proportionately more onerous for weaker offices.

4.2.8 If the FSA is concerned to ensure all companies can survive a given economic shock (i.e. to manage systematic risk) this test is appropriate. However it will not lead to a uniform probability of ruin for offices, nor will it necessarily lead to a probability of ruin in line with the FSA’s “BBB” standard. The FSA is cognisant of these issues and is seeking further advice on them. As such, the current tests must be considered provisional.

### 4.3 Calibrating the stress tests

4.3.1 If the stress test is to truly allow hedging in the event of a significant market fall then a number of other adjustments should theoretically be made to the current proposals. These are to allow for correlation, granularity, volatility changes and liquidity.

4.3.2 The most important of these is an allowance for changes in implied volatility levels. Currently these are assumed to remain constant after a fall, i.e. option prices do not change. Historically this has not been the case and volatility has “spiked” in market crises. If the aim is to hold enough capital that an office would be solvent on a realistic basis after such a scenario, then these higher volatilities should be used in the RCM calculation, although not in calculating the realistic solvency position itself.

4.3.3 Similarly, in most market falls there is a reduction in liquidity and tightening of market capacity. This may be a cause of the rise in option prices and should not be

double-counted. However, this also suggests that “haircuts” might be applied to asset values in the RCM calculation, if the stress tests are to be truly “realistic”.

4.3.4 Granularity describes the impact of holding a less than perfectly diversified portfolio. Individual equities are more volatile than indices; credit risky bonds either default or not, rather than exhibiting a smooth rate of default. None of these affect the calculation of market consistent values, but they do affect the distribution of losses in a stress scenario and some additional capital may be required for this failure of the law of large numbers. A specific granularity adjustment is included in the current Basle II discussions on credit risk modelling for banks, and seems equally appropriate for insurance companies. If this is not allowed for in the RCM it should perhaps be an item for ICAS.

4.3.5 All of the above aspects would tend to increase capital requirements. However, in CP195 it is assumed that there is 100% correlation between stress tests in setting the stress scenario. In reality correlations may be quite low, which can significantly reduce the capital required. It should be noted, however, that in extreme circumstances correlations do tend to increase, and as such the assumption of 100% correlation may not be as prudent as it originally seems.

4.3.6 As noted by the FSA, the stress tests currently make no allowance for non-economic risks other than lapses. For a fully “risk based” capital margin, some allowance would be appropriate. In theory this should differentiate between allowances for statistical variation (similar to the granularity adjustment discussed above), for risks such as lapses which may be correlated with market movements, and for other, non-correlated, changes in future experience.

4.3.7 To allow for each of these risks appropriately would require detailed modelling by insurance companies, and is likely to be harder to allow for in a simple stress test. In addition, the “one-year and hedge” model that underlies the RCM may not be appropriate for such risks, for which no active hedging market is currently available. Even allowing for the existence of the reinsurance market as a possible route, a longer action period and a prudent view of prices would be required. It seems likely that a relatively simple allowance for these risks will be the most that is possible under the RCM, and that greater sophistication will only arise under the ICAS regime.

## 4.4 Sources of capital

4.4.1 CP195 defines the capital required, and also where it should be held. As a minimum, there must be sufficient assets (including the value of non-profit business and excess admissible assets) to cover the realistic liabilities. The long-term insurance capital requirement and resilience capital requirement, under the regulatory peak, and the RCM under the realistic peak can be held outside of the with-profits fund. There are, however, a few areas where the proposals in CP195 are not entirely clear or appear somewhat restrictive. These relate to:

- (i) the allowance for support arrangements, such as contingent loans into the fund
- (ii) the value attributed to contingent loans from the with-profits fund
- (iii) the treatment of future shareholders transfers, and
- (iv) the treatment of subordinated debt

4.4.2 Support arrangements vary in nature but might typically be in the form of contingent loans available to the fund, which may be drawn down if the realistic surplus position falls below a predetermined level. Provided such arrangements are only repayable out of future realistic surplus, it seems reasonable that these may be valued as an asset in the realistic balance sheet to the extent that they are not repayable – and we believe this is the intended treatment.

4.4.3 Our reading of CP195 suggest that where the with-profits fund has provided a loan to another fund or company, then this cannot be counted as an asset in the realistic balance sheet if it is inadmissible in the measurement of the regulatory peak. This situation could occur where such loans are secured on future profits from non-profit business in another fund. However, it would appear inconsistent to not allow any value to be placed on such loans, when value could be attributed to the profit streams on the non-profit business if the business had been written directly into the with-profit fund.

4.4.4 It also seems reasonable to value the future stream of shareholders' transfer in a 90:10 fund, as an asset, for the purposes of covering the RCM, although only to the extent it would be of value in the stressed scenario. This is because a company will not be able to distribute any amounts arising from such transfers in the future, if the company cannot meet its realistic capital requirements. As such these amounts would be available to cover the capital requirements and ultimately meet any deficit in the with-profits fund. We

therefore wonder whether the existing proposals are unduly harsh, potentially omitting this valuable source of capital?

4.4.5 A further form of capital which is available to meet regulatory solvency, within certain limits, is subordinated debt. For the purposes of the realistic peak, however, financing costs and repayment of capital are treated as a liability to the extent that they would be payable. This raises the question as to whether sub-debt should be available in the realistic peak, either in whole or in part, to cover the RCM. Provided that the sub-debt is fully subordinated to policyholders' interests, a case can be made that (subject to EC limits) it should be treated as equity and be available to cover the RCM. We believe this would be similar to the treatment in banks, and general insurance companies, and would be consistent with the treatment of such debt in the regulatory peak and in non-profit funds.

4.4.6 Another approach might be to value the sub-debt on a 'market consistent' basis. As there will be some scenarios where payment of all or part of the financing cost or repayment of capital would not be possible, the debt would be valued at below face value and as the likelihood of repayment reduced in adverse scenarios, a lower value would be placed on the liability. Alternatively, quoted sub-debt could be taken at market value for this purpose. The appropriate treatment for sub-debt clearly raises some difficult issues, which need to be resolved.

## 5. ALLOWING FOR MANAGEMENT ACTIONS

### 5.1 Introduction

5.1.1 A crucial aspect of the realistic reporting regime is that the realistic liabilities should reflect the manner in which a firm intends to manage its with-profits business, as documented in its PPFM.

5.1.2 Whilst the principle is straight forward enough, trying to reflect the complex interactions between the financial condition of the company, bonus policy and investment policy, in a wide range of future economic and operational scenarios, over a period of 40 years or more, is in fact extremely difficult in practice. Add to this the impact of policyholder actions which will also be influenced by economic conditions, the financial condition of the company and management actions themselves, and the size of the task quickly becomes apparent.

5.1.3 In this section we discuss some of the approaches being used to calculate elements of the realistic balance sheet, allowing for management actions, and then go on to consider the question of what actions may reasonably be taken in more extreme financial conditions.

### 5.2 Defining management actions

5.2.1 Any realistic balance sheet calculation makes allowance for management actions, albeit at the most basic level, as bonus policy is set at management's discretion. For example, the assumption that bonuses target asset shares, subject to guarantees, is a model of management action, even if an extremely mechanical one.

5.2.2 In practice the issue is how to model management actions which differ from this mechanical approach. Actions that could occur range from the simple to the complex. Obvious actions include:

- Calculating terminal bonuses using some form of (possibly mechanical) smoothing policy;
- Targeting less or more than 100% of asset shares;
- Switching assets in response to market movements or solvency considerations;
- Varying reversionary bonuses with economic conditions.

More complex actions include the introduction of charges for guarantees, the purchase of hedging instruments, complex reinsurance deals and the closure of the office to new business.

### 5.3 Modelling techniques incorporating management actions

5.3.1 Many companies are inevitably taking a simplified approach to modelling management actions and currently we see three broad levels of sophistication, dependent on the general approach to liability valuation:

- a) A combination of deterministic and closed form solutions (e.g. using the Black-Scholes formula or equivalent) to valuing options and guarantees on a market consistent basis, with no or very limited allowance for management actions. We refer to this as the closed form approach.
- b) Stochastic simulation using projection models to value options and guarantees, but again with no, or very limited, management and policyholder actions. We refer to this as the stochastic simulation approach.
- c) Stochastic simulation using projection models, with dynamic management and policyholder actions incorporated. We refer to this as the dynamic simulation approach.

5.3.2 Most companies are currently using methods a) or b), although in our experience there is some variation in the type and extent of management actions incorporated in the underlying calculations. A few companies have developed their approaches as far as c), although we expect more to move in this direction, driven by the need to calculate risk based capital as well as realistic balance sheets. We are not aware of any companies using market prices directly as a valuation approach apart from those holding swaption portfolios to hedge their GAO reserves. The following describe the various approaches which might typically be used in more detail.

#### ***a) The closed –form approach***

5.3.3 Typically the cost of guarantees is determined assuming reversionary bonuses at a level deemed appropriate for the less favourable scenarios, and investment policy is based on the current asset mix. Best estimate lapse rates are used to determine the number of policies reaching the guarantee date, and liabilities reflect the current levels of charges, future premiums and enhancements to asset shares. Smoothing is usually approximated



within the option pricing formula or ignored, depending upon the level of sophistication. No further allowance is made for management actions.

5.3.4 Management actions are, however, often incorporated in the calculation of the realistic surplus in the stress scenario, for the purposes of determining the realistic capital margin. These actions are assumed to occur at the time of the stress test and are not revisited at a later time in the projection. As discussed earlier, these actions might typically include reduced or zero reversionary bonus rates, increased deductions from asset shares, an assumed asset switch following the market fall, possible changes to smoothing policy, and retention of surrender profits or other miscellaneous surplus.

#### ***b) Stochastic simulation approach***

5.3.5 A few companies are already using this approach, primarily to determine the cost of basic guarantees and GAOs, while others are in the process of building their stochastic models. By running a large number of risk neutral (or equivalent) investment scenarios, and taking the average discounted value of the cost of guarantees and GAOs, the market consistent cost of these guarantees can be determined. However, in most cases the assumptions regarding bonus policy, the charges deducted for costs of guarantees, and the investment policy are all deterministic, rather than varying depending on each of the specific scenarios.

5.3.6 As a result, the values obtained should be consistent with those derived from the closed form solution approaches as described in a). Indeed, we recommend that results from simulation approaches are validated against analytic methods before moving to a dynamic simulation approach. This simple stochastic modelling approach represents a trade-off between the longer run times that simulation requires against the intellectual investment of setting up closed form models.

5.3.7 We are aware of companies who are at a “halfway house” stage, where they apply risk neutral probabilities to a range of deterministic projections to approximate a market-consistent valuation. If done properly this approach is valid when payments to policyholders and others are not path-dependent, i.e. depend only on the asset values at policy maturity and not how they were reached. Otherwise they break down and are likely to give results inconsistent with market prices.

### ***c) Dynamic simulation approach***

5.3.8 The real power of stochastic simulation models is only realised if management and policyholder actions can be made truly dynamic. This allows values to reflect actions that cannot in practice be calculated using any other method.

5.3.9 Dynamic simulation refers to a modelling approach where, in each scenario, cash flows and all management actions depend upon the particular circumstances at each point in time, in each scenario. Hence in poor scenarios dynamic modelling will reflect lower reversionary and terminal bonus rates, less risky investment approaches, potentially higher policyholder lapses and so forth.

5.3.10 As discussed below, successful dynamic simulation requires both an understanding of the actions that the office would take in times of stress and an ability to model the various inputs, e.g. the future solvency level, that would determine those actions. Such modelling is complex and we are not aware of many offices that have yet reached this level of sophistication, although for some it is their ultimate goal.

5.3.11 There is a common assumption that allowing fully for management actions will reduce the realistic liabilities and RCM. This is not always true, as some of the following examples illustrate.

## **5.4 The impact of management actions**

5.4.1 The most generally considered management actions are changes in bonus policy, smoothing policy and in asset strategy. The tables below illustrate the impact of such actions upon both the realistic surplus and the RCM. The first table illustrates the impact of a one-off change in approach, as might currently be adopted in calculating the RCM. The second table illustrates the impact of some dynamically modelled strategies. Appendix B gives more details of the actions modelled.

**TABLE 5.1****Impact of selected management actions on realistic working capital, the RCM and realistic surplus**

	<b>Working capital (A)</b>	<b>RCM (B)</b>	<b>Realistic surplus (A – B)</b>
1) Increase Smoothing from 3 to 5 years	+46	+3	+43
2) Reduce EBR to 40% (from 50%)	+49	-15	+64
3) Reduce future reversionary bonus rate by 1%	+181	-110	+291
4) Target 98% asset share (instead of 100%)	+117	+23	+94
5) Introduce 0.5% p.a. guarantee charge	+119	-4	+123

5.4.2 The impact of smoothing illustrates one area where common beliefs may not always be correct. It is often held that smoothing has a significant cost and that reducing or removing smoothing will reduce liabilities. However, as shown above, an increase in the period of smoothing used in our model increases the realistic surplus (i.e. reduces liabilities) by £43m.

5.4.3 In practice “smoothing” can mean several different things. If payouts are above asset shares and an office is only gradually reducing the level of payouts to that supportable by assets shares, in a deterministic fashion, this will result in a positive cost. In this sense removing smoothing may reduce costs if payouts are currently above their supportable level. For our hypothetical office this element of smoothing currently adds £42m to realistic liabilities set out in Section 2.

5.4.4 If however payouts are close to asset shares, then in general, such smoothing formulae should either have little impact on liability values or reduce them. The expected payments, ignoring guarantee costs, are typically unchanged (for arithmetic smoothing) or fall (for geometric smoothing). However smoothing should reduce guarantee costs, as smoothing reduces volatility, the key driver of these costs. In our basic calculation, as set out in Section 2, the impact of smoothing is to reduce guarantee costs by £6m. Increasing the period of smoothing from three to five years increases the realistic surplus (i.e. reduces liabilities) by £43m.

5.4.5 Reducing the EBR has a significant impact, as would be expected, as it reduces the future volatility of returns and thus the chance that guarantees will be triggered. A reduction of ten percentage points in the EBR increases realistic surplus by £64m.

5.4.6 Reducing assumed reversionary bonus rates has a significant impact on both the realistic working capital and the realistic surplus, particularly on the latter, increasing them by £181m and £291m respectively. These are the largest changes of any of the deterministic actions we tested. They are already reflected in the calculations in Section 4. However a deterministic bonus rate that is unaffected by economic scenarios is unrealistic and may overstate the real impact of such a change. We discuss a more realistic approach later.

5.4.7 Targeting payments of less than 100% of asset share and introducing an annual charge for guarantees both have a similar impact on the realistic working capital, but it is noticeable that the annual charge has a proportionately greater impact on the realistic surplus. This is because the stress scenarios have a different affect on short duration policies, where annual charges are less valuable, compared to that affect on longer duration policies, where annual charges are more valuable.

5.4.8 It is important to consider whether the deterministic actions modelled above are really representation of management actions, or whether these would vary with economic conditions. To fully address this issue an office needs to model how the policy would be managed in each possible scenario of a simulation, i.e. move towards a dynamic simulation approach. Table 5.2 below gives two interesting examples of this in practice. We have only examined the impact on the realistic working capital.

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**TABLE 5.2**

**Impact of dynamic simulation on realistic working capital**

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	<b>£ millions</b>
6) Scenario specific reversionary bonus rates	-118
7) Scenario specific matching	+127

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5.4.9 In the first example, the model allows reversionary bonus rates to change in line with bond yields rather than remaining fixed over all scenarios. Introducing such a rule

increases realistic liabilities, even though in this example, the average reversionary bonus rate across all scenarios is unchanged. In this case more realistic modelling of management actions actually increases liabilities and reduces the solvency of the fund.

5.4.10 The technical reason for this result is that allowing both the guarantee level and the underlying asset to vary gives an effective increase in volatility. Put another way, there is now the possibility that situations will occur where a period of higher than average reversionary bonuses will be followed by a fall in asset values, and a guarantee bites that would not have been effective if bonus rates were deterministic.

5.4.11 In the second example we have allowed a more complex investment strategy to be used. On average we keep the level of equity backing unchanged at 50% but do not rebalance each year, instead dynamically modify the fixed interest portfolio to best match the guarantees in the portfolio. This better matching increases the realistic working capital significantly. Interestingly, simply adopting a static durational matching strategy for the fixed interest assets only has half as big an impact, increasing the realistic working capital by £66m.

## 5.5 Which management actions are appropriate to model?

5.5.1 The management actions modelled should be consistent with those set out in an office's PPFM. They will address issues such as charges, smoothing rules and the percentage of asset share targeted. In the past companies have often set themselves inflexible rules in regard of these issues, for example limiting the annual amount by which bonuses or total payouts could change. The economic upheaval of recent years has demonstrated that such rigid rules can be difficult to follow in market downturns without compromising solvency.

5.5.2 While the practices set out in an office's PPFM will clearly address the approach taken to managing the fund "in normal circumstances", these actions are not likely to have a significant dampening affect on capital requirements following a stress test. Rather it is changes in these practices as economic conditions change which will have the most impact. We would expect companies currently drafting their PPFMs to be aware of this need for flexibility and reflect it in their principles, although some may be limited by past pronouncements.

5.5.3 For offices which have already set out in detail the approach they will take to bonus declarations and asset strategy the room to manoeuvre is limited. This would

typically include funds which have been through a reconstruction and funds where marketing materials promise a specific rule. Such funds would appear to have a clear definition of allowable management actions. The issues remaining are then simply in terms of effectively modelling the outcomes.

5.5.4 At the other extreme, for closed funds with no external support there appears to be precedent that bonus policy and asset strategy can be changed more aggressively. It seems that in such circumstances, in treating policyholders fairly, meeting guaranteed benefits takes precedence over possible future discretionary benefits.

5.5.5 For other offices, it is less clear in what circumstances aggressive management action can be taken. We would argue that where a fund is insolvent (i.e. cannot meet its liabilities) on a realistic basis it would be reasonable for quite extreme actions to be adopted, such as matching liabilities as closely as possible. After all, were a fund to get into such a position we would expect the FSA to require drastic action to protect policyholders' guaranteed benefits. Equally we would expect action to be taken, albeit of a less severe nature, if the RCM is breached. This again reflects the regulatory approach set out in CP195.

5.5.6 Given the above, a practical approach might be that set out below.

- If neither the RCM nor realistic solvency is threatened, management actions might be restricted to the current practices set out in the PPFM.
- If the RCM is threatened, more drastic actions such as greater reductions in EBR, or targeting less than 100% of asset share might be modelled. The actions may also include closure to new business, although the impact of this may not be apparent given that new business is not modelled in the realistic balance sheet.
- If the realistic solvency is threatened, any actions necessary to protect guaranteed benefits may be appropriate.

It is obviously helpful if the principles make clear the need for flexibility to change the management approach of the fund in response to extreme economic circumstances and solvency considerations.

## 5.6 Practical issues

5.6.1 To the extent that management actions can be modelled as simple rules, based only upon observable items, such as returns on asset shares, modelling is straightforward. However when future actions depend upon the then current solvency position the situation becomes much more complex. In general we believe that most significant management actions will be at least partly solvency driven. Therefore if any but the simplest management actions are to be allowed for, the future solvency position of the fund must be modelled.

5.6.2 A decision that depends upon future solvency requires the modelling of that solvency at each point in time, in each possible scenario. In theory that would require a full dynamic simulation to be run at each point. For a simple model using only 1,000 simulations and a 40 year time span this would increase the number of calculations required 20,000-fold. Such an approach is clearly unrealistic.

5.6.3 Perhaps the only practical alternative is to approximate the realistic solvency in the future using either a closed-form approach or other simple methods which assume, for the purposes of the solvency valuation, that the future actions are fixed at the point where the valuation is being calculated. This reduces the calculations required to manageable levels.

5.6.4 Another fundamental issue is that the management actions that might be taken are generally difficult to visualise in advance. One or two offices have been modelling their with-profits portfolios (on a “real world” basis) for many years and have a good link between actual and modelled actions. For most others this is not the case. It remains to be seen how much credence the FSA will give to such, as yet untested, plans for the future.

5.6.5 Finally, the realistic balance sheet is a closed fund calculation. As such it is clearly appropriate for a fund in run-off. We believe it is also appropriate for an open fund, as it is in effect asking whether it would be able to survive being placed into run-off if circumstances required it. However most open funds do not have management strategies in place suitable for running a closed fund. The PPFM are likely to describe management actions applicable to an open fund, and these should be built into the basic model interactions. However, in scenarios where solvency is threatened, and at which point the company would be most likely to cease writing new business, the future actions might follow a different set of rules, post closure.

## 5.7 “Useful vs. Perfect”

5.7.1 Given the complexity of modelling management actions it is worth asking what would be useful to regulators, even if it isn’t perfect. One possibility is not to anticipate future management actions, except in a very limited way, in calculating the realistic liabilities in the base scenarios. This might mean modelling future smoothing rules etc., but not allowing for significant changes in asset strategy or bonus policy in the future. In calculating the RCM different asset strategies / bonus policies could be assumed for the stress scenarios, but these alternative strategies would remain constant in the future.

5.7.2 This would probably give a prudent view of the realistic liabilities, although some of this prudence would be removed by allowing for a change in management actions when calculating the RCM. This approach might require slightly more capital than a fully dynamic approach, but would be much easier to calculate. This would show the impact of the status quo, and thus provide a yardstick against which to compare possible alternative approaches. Overall, it might be the most pragmatic solution.



## 6. CONCLUSIONS

6.1 The proposed approach to realistic reporting in CP195 is a significant step forward for both regulatory purposes and as a basis for financial management of a with-profit fund. It should meet the primary objectives of the FSA, namely to ensure that explicit allowance is made for discretionary policyholder benefits and that the liabilities are more responsive to changes in the level of such benefits when market levels fluctuate.

6.2 The “twin peaks” approach which is proposed to achieve the objective of realistic reporting within the constraints of the EC Directive could be simplified, and transparency improved, by altering the proposed components of the realistic liabilities to show separately the value of guaranteed benefits and the additional value of discretionary benefits within one peak.

6.3 A number of issues arise in calculating the value of realistic liabilities and the RCM, in particular relating to the valuation of options and guarantees embedded in with-profit products. Best practice is slowly emerging as actuaries develop practical experience in calculating the liabilities. The profession is taking a leading role in establishing the appropriate approach to these issues, including defining tests for calibration of “market consistent” asset models.

6.4 The value of discretionary benefits (and options thereon such as GAOs) are dependent on the impact of management and policyholder actions, and considerable complexity is involved in allowing for such actions in calculating “realistic” values. Actions need to be consistent with each company’s PPFM and with treating customers fairly, and companies are only now, for the first time, having to document in detail their basis for exercising discretion for with-profits contracts. No doubt the PPFM will continue to change and be refined over a number of years as management techniques and policyholder expectations develop over time.

6.5 A significant amount of ongoing development work will be required for most companies, over a number of years, before the methodologies and tools used in realistic reporting are fully robust. Because of the significant complexity of the calculations and the judgemental nature of the management actions, we believe it will be some years before the realistic liabilities, in particular the provision for discretionary benefits, will be produced to audit standard.

6.6 We look forward to participating in the evolution of this methodology over the coming months and years. The proposals outlined in CP195 have already resulted in significant change throughout the with-profits industry, and will continue to do so as companies adjust to a realistic reporting methodology and risk based capital regulatory approach.

## APPENDIX A – MARKET CONSISTENT VALUATIONS

### ***What is a market-consistent valuation?***

A.1 A market consistent valuation places values on assets and liabilities consistent with the market values of assets with similar cash flow patterns. For example, a liability that consisted of a promise to pay £100 in 10 years time would have a market consistent value in line with a high grade 10-year zero coupon bond that also pays £100 in 10 years time. In essence, a market consistent valuation is answering the question “If the assets or liabilities under consideration were actually traded in an efficient market, what price would investors put on them?”

### ***How should a market-consistent value be calculated***

A.2 There are many ways to calculate market consistent valuations, and the appropriate ones to use vary with the task at hand. CP195 considers two

- replication using market prices, and
- market-consistent stochastic models.

A.3 At its simplest, an asset or liability can be decomposed into the sum of its parts and the market value of each part calculated. To do this, an insurance contract could be split up into a number of bonds and put options etc, and the value calculated by summing up the market price of each bond and option at the valuation date.

A.4 This is the first approach suggested and is the most robust, as no modelling or other assumptions need to be made. However the approach has practical drawbacks: the decomposition can be very complex and time consuming and often there are not market prices for some of the components of the insurance cash flows.

A.5 A practical approach is to find an approximation (formula or model) that gives a good fit to the prices of traded assets and use this to value the cashflows instead. The approach is similar to using a graduation formula to produce mortality or morbidity rates rather than always looking up the probabilities from an experience study.

A.6 Typically the “graduation” formulae used come from economic theory, such as the Black-Scholes model, but in practice these are just used as a way of interpolating between or extrapolating from existing market prices.

A.7 A market consistent asset model must not allow arbitrage to exist. CP195 also suggests that a market-consistent model cannot have other features such as mean-reversion. This is incorrect – it is only a requirement that such features cannot lead to arbitrage profits.

A.8 The crucial point is that the model must reproduce the prices of existing options closely (how closely is a matter of judgement). To do this the parameters of the model are chosen to give a best fit to traded option and other asset prices. As in a mortality graduation the parameters are a function of the underlying data (the market prices) rather than variables which the user is free to choose, and hence there is little subjectivity in the process.

## APPENDIX B – MODEL ASSUMPTIONS

### Business profile

B.1 The business in force in the With Profit Fund as at valuation date consists of the following products:

- Conventional with-profit (CWP) life regular premium Endowment (terms 10 and 25),
- Conventional with-profit (CWP) pensions regular premium Endowment,
- Unitised with-profit (UWP) life single premium Bond,
- Unitised with-profit (UWP) pensions Regular Premium Endowment and
- Non-profit pensions immediate annuity.

Model points were selected to be representative of a typical UK proprietary life office. About half the with profit asset shares are from UWP business.

B.2 The CWP pension policies carry significant guarantees in the form of GARs. On withdrawal, no MVAs apply at the 10<sup>th</sup> policy anniversary for UWP life bonds. There is a formulaic surrender penalty on UWP pensions.

### Liabilities

B.3 Table B.1 sets out the liabilities in the fund by product as at valuation date.

**TABLE B.1****Deterministic Liabilities by Product as at 30 June 2003**

	<b>Policy count (‘000s)</b>	<b>APE (£m)</b>	<b>Liabilities (£m)</b>
CWP RP Endowment	221.0	14.1	1238.4
UWP SP Bond	210.5	8.5	1625.5
<b>Total With Profit Liabilities – Life</b>	<b>431.5</b>	<b>22.6</b>	<b>2863.9</b>
CWP RP Pension	150.0	5.2	1906.7
UWP RP Pension	202.0	7.6	783.3
<b>Total With Profit Liabilities – Pensions</b>	<b>352.0</b>	<b>12.7</b>	<b>2690.0</b>
CNP Pension Annuity	91.0	114.5	1133.3
<b>Total Product Liabilities</b>	<b>874.5</b>	<b>149.8</b>	<b>6687.3</b>

The liabilities shown in the table are smoothed asset shares for the with profit products and the mathematical reserve for the non-profit pension annuity.

### Bonus Policy

**B.4** For the With Profits products, payouts are set to target smoothed asset shares. Asset shares are calculated monthly and are smoothed following a 3-year geometric algorithm. On conventional with profits products, there is a formulaic surrender value basis based on the value of guaranteed benefits discounted for the outstanding duration from the time of surrender to the original maturity date. The only guarantees on death or maturity are the sum assured plus accumulated reversionary bonuses to date. For conventional with profits business, death strains are deducted from asset shares. The cost of shareholder transfers are borne by the asset shares.

**B.5** For unitised with profits business, asset shares are calculated net of product charges. 100% of premiums paid are allocated to units. Apart from an annual management charge of 1%, no additional charges are deducted from the investment return credited to asset shares. Partial withdrawals of 2% p.a. are assumed for the unitised with profit Bond. MVAs are allowed on surrenders. For the with profit Bond, there is a

guarantee that MVAs are not applied at the 10<sup>th</sup> policy anniversary. In addition, no MVAs apply on partial withdrawals.

B.6 Future reversionary bonuses are projected at the constant rates for each product class set out in the following table.

**TABLE B.2**

**Future reversionary bonus rates**

Product class	Annual bonus rate
CWP Life	1.00%
CWP Pensions	1.50%
UWP Life	2.75%
UWP Pensions	3.00%

## Assets

B.7 Non profit liabilities in the with profit fund are assumed to be backed by fixed interest assets and cash. At the start of each year the assets backing the non profit business are set to be equal to the non profit reserve at that time. Investment returns for each future year are determined at the start of the year assuming the asset mix specified in the assumptions for that year. The asset mix at the start of each calendar year is assumed to be constant, and it is assumed that no gains or losses arise from rebalancing the assets.

B.8 Table B.3 sets out the asset mixes assumed for each of the asset funds in the model.

**TABLE B.3**

**Asset mix**

	UK Equity	Overseas Equity	Property	Cash	Fixed Interest		
					Short Term	Medium Term	Long Term
WP Assets	50%	0%	0%	5%	15%	15%	15%
NP Assets	0%	0%	0%	10%	30%	30%	30%

At 30 June 2003 the starting assets consist of £6.0bn allocated to With Profit assets and £1.2bn allocated to Non Profit assets.

## Methodology

B.9 The model rolls up the asset shares from point of entry using historic investment returns. At the valuation date the model asset shares are rescaled to the actual number of policies in force. For non profit business the mathematical reserve is calculated at the valuation date as the gross premium reserve.

B.10 For with profit business, asset shares, guarantees and future cash flows are projected forward using risk neutral investment scenarios calibrated to be market – consistent as at end June 2003. The cash flows are then discounted back to valuation date using the appropriate risk- neutral discount factors. The cost of guarantees is determined as the present value of any shortfall between the asset shares and guaranteed benefits. The cost of smoothing is determined as the discounted difference at the time of claim between:

- the greater of smoothed asset shares and guaranteed benefits and
- the greater of unsmoothed asset shares and guaranteed benefits.

B.11 The projections are carried out using 2000 random risk neutral scenarios and the mean discounted values from this process are taken. No future new business is projected to be written in the existing With Profit Fund.

### ***Risk Capital Margin calculations***

B.12 The above process is repeated under the assumptions prescribed by the FSA in order to test capital adequacy for market, interest rate and persistency risks as at 30 June 2003. The amount of risk capital required is then taken to be the difference between the mean discounted values of realistic surplus under the two sets of assumptions.

B.13 Risk neutral investment scenarios are regenerated in line with the assumptions prescribed by the FSA, and calibrated to be market – consistent at 30 June 2003 taking into account these assumptions. The assumptions are also reflected in an immediate change in the level of the asset funds and asset shares as at valuation date.

B.14 It was found that for this company, the equity fall that should be assumed for the capital buffer scenarios was 10% and the direction of the shift in the yield curve should be downwards. It should be noted that the company holds no property and no corporate bonds in its asset portfolio.



B.15 No changes to management action are assumed in the stress test. Instead the impact of individual actions are considered in Section 5.

***Effect of management actions***

B.16 Sensitivity tests to the following management actions were considered.

1. Three year smoothing of asset shares changed to five year smoothing of asset shares in future.
2. Future EBR reduced from 50% to 40%, asset mix constant in all future years.
3. Future RB rates reduced by 1%.
4. Targetting 98% of smoothed asset shares instead of 100% on maturity.
5. Charging for guarantees via a 0.5% reduction in investment returns on asset shares.
6. Dynamic future RB rates determined as the gross redemption yield on a 10 year bond with a 5% coupon less a margin which varies by product line. The margin is determined so that the gross redemption yield at the valuation date net of this margin is equal to the RB rate originally assumed to apply in 2003 onwards. The year on year change in the RB rate is limited to 0.5% and RB rates are also set to a minimum of 0%.

The margins are 3.50% for CWP Life, 3.00% for CWP Pensions, 1.75% for UWP Life and 1.50% for UWP Pensions.

7. Fixed interest and cash assets in future years set at the end of each year to match discounted guaranteed benefits, with EBR varying accordingly.