

RESERVING FOR ANNUITY GUARANTEES

The Report of the Annuity Guarantees Working Party

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RESERVING FOR ANNUITY GUARANTEES

Annuity Guarantees Working Party

1. INTRODUCTION

1.1 *The Problem*

Historically many pension contracts issued by life companies contained options to convert the cash proceeds of the policy on retirement into annuities on terms guaranteed in advance. Such options were particularly common up to the mid-1980's and have progressively been withdrawn for new business by companies since then. Nevertheless, companies collectively have over £35bn of liabilities to which such guarantees apply. With relatively low interest rates and improving mortality, the guarantees are now potentially very valuable.

To date, there has been no industry wide attempt to analyse the nature of the guarantees and the approaches currently adopted by companies to reserving for them. Nor has there been any attempt to consider appropriate reserving standards in the light of the Insurance Company Regulations.

1.2 *The Annuity Guarantees Research Group*

In January 1997, a working party sponsored by the Life Board of the Institute and Faculty of Actuaries, was set up to consider these issues. The full terms of reference of this group are set out in Appendix 1.

This report represents the findings of the Working Party.

1.3 *The Approach to the Research Project*

The Working Party undertook three principal streams of activity in order to carry out its task:

- (a) It undertook a survey of all life companies and friendly societies transacting pensions business to determine the nature and extent of guarantees currently in-force and the approach taken by companies to reserving and related issues. The key findings from the survey are set out in section 2.
- (b) An analysis was made of the implications of guarantees for statutory reserving consistent with the Insurance Companies Regulations. The findings are set out in sections 3 and 4.
- (c) Two alternative approaches to measuring the value of the guarantees were considered. These were to consider the reserves required under various stochastic investment models (section 5) and a market based approach using financial instruments to hedge the guarantees (section 6).

The conclusions of the Working Party are summarised in section 7.

Thanks

The Working Party is very grateful to all those who responded to the questionnaire and particularly for finding the time to do so while in the middle of completing DTI returns!

Particular thanks are due to Shyam Mehta for explaining patiently the use of financial instruments and for providing illustrative price quotations.

2. KEY FINDINGS FROM THE QUESTIONNAIRES

Questionnaires were issued to 85 insurance companies or groups of companies writing pensions business. Responses were received from 66 companies, of which 41 have annuity guarantees and 25 do not.

We estimate that the responses represent at least 90% of the total market measured by liabilities and probably more by current new business volumes. Almost all data was as at 31 December 1996.

2.2 For the companies with guarantees:

total long term liabilities	£304bn
total long term assets	£370bn
liabilities for contracts with guarantees	£35bn

2.3 Contract types with guarantees covered the full range of group and individual pensions; traditional with-profits, unitised with-profits and unit-linked.

2.4 Almost all companies have ceased offering guarantees on brand new business. However, in the majority of cases the guarantee applies to regular premiums at the initial level, premium increments, one-off single premiums and (in the case of group schemes) to new members.

2.5 Contract terms for application of the guarantee vary widely. At one extreme it may only apply if retirement takes place at a specified exact age and if the annuity is taken in a specific form (e.g. Single life only with no guaranteed payment period and no contractual escalation). At the other extreme it may apply at a wide range of ages and for any style of annuity.

2.6 The guaranteed rate also varies widely.

For Male age 65 level annuity the highest guaranteed annuity was £132.27 per £1000 consideration. The lowest was £71.89.

The most common was approximately £111 per £1000 consideration. It is probably not a coincidence that for many years this was the Standard Inland Revenue approved factor for Cash commutation in occupational pension schemes (i.e. £9 per £1 pension). It corresponds to a basis of approximately a(55) unrated at 6.5% with no allowance for expenses

2.7 Companies appear to be split equally in terms of their current approach to reserving for annuity guarantees.

One group takes no account of the guarantee. The remainder calculate the liability for each policy as the greater of the value of the cash option and the value of the guaranteed annuity on the valuation basis.

Few companies make explicit allowance for the effect of future premiums to which the guarantee will apply.

On the resilience test, many companies said or implied that their reserves were recalculated on the resilience scenarios.

However a number said that no allowance was made in the resilience reserve, possibly because the more onerous test for the fund as a whole reduced the impact of the annuity guarantee.

The great majority of companies took no account of guarantees in setting investment guidelines.

On with-profits business, the majority of companies have to date made no allowance for the guarantee when establishing maturity values. A small number have made general adjustments to asset shares underlying payouts and a small number have made specific adjustments to terminal bonus rates.

A number of PRE issues, on both payouts and on the application of the guarantee, were raised which are discussed further in section 4.

3. **RESERVING FOR ANNUITY GUARANTEES**

Inter-relationship of Elements of a Guaranteed Annuity Option (GAO) basis.

The rate of annuity option guaranteed on a contract will initially have been determined on a particular assumption of mortality, interest and expenses. Any single rate for a particular age and type of annuity could be produced from a number of different combinations of those assumptions, as can be seen in Table 3.1 of Appendix 3. This shows the interest rate that is effectively guaranteed by a particular GAO rate when the mortality basis is varied.

3.2 One particular example of this variation is the secular trend of improvement in mortality. At the time many of the GAO rates were introduced, during the 1960s and 1970s, it was considered appropriate to use a mortality table with no explicit allowance for future improvement, such as a(55), and what must have seemed a relatively conservative rate of interest. Table 3.2 in Appendix 3

illustrates how, as mortality has improved over time, the effective rate of interest that is guaranteed in a particular GAO under such contracts has increased. For example, an improvement equivalent to 3 years' age rating in mortality leads to an increase of around 1.2% p.a. in the rate of interest that is being guaranteed. Over the period of, say, 25 to 30 years since some of these options were first introduced this would not be considered an excessive rate of mortality improvement.

- 3.3 Where an annuity option has been calculated on a table that makes explicit allowance for future improvements, e.g. PMA80 projected, the increase may be slightly smaller as time progresses but it still amounts to about 0.8% p.a. over a 30 year period (see Table 3.3 of Appendix 3). This arises because, unless a different GAO applies for each age at inception of a contract, no specific allowance can be made for mortality improvement over the period up to the age at which the option is exercised.
- 3.4 As well as the critical relationship between mortality and interest assumptions, it should be noted that other elements play their part in the calculation of particular GAO rates. Tables 3.4, 3.5 and 3.6 of Appendix 3 show the variation in the effectively guaranteed rate of interest on a fixed mortality assumption when the annuity frequency, annuity guarantee period and allowance for expenses are varied.

Deterministic Approach to Reserving

- 3.5 Section 2.7 stated that some companies calculate the liability for each policy as the greater of the cash option and the value of the guaranteed annuity on the valuation basis.

One possible approach is to calculate an additional 'cost' percentage to apply to reserves held for the relevant products, assuming that those reserves are appropriate for the contract ignoring the guarantee.

- 3.6 This deterministic approach involves

- i) calculating a projected fund at normal retirement age (NRA) on a realistic basis ignoring future premiums and thus a guaranteed annuity.

- ii) calculating the reserve at NRA required to meet the guaranteed annuity, using the valuation basis.
- iii) determining the cost of the guarantee at NRA as the difference between the reserve and projected fund, expressed as a percentage of fund.
- iv) increasing the reserves held for the relevant product by this 'cost' percentage.

Where the liability relates directly to the value of an internal fund (such as a unit-linked contract), the basis for the projection in part (i) above becomes irrelevant provided the additional reserve is held in the same matching assets. For with-profits payments based on asset shares, this is largely the case but issues such as smoothing mean that the matching is not precise.

The method described above is effectively a paid-up approach ignoring any margins or ability to adjust existing reserves. If the guarantee applies to future premiums, as the survey implied is usually the case, then the same cost percentage could be applied within any projected cashflows as an item of outgo. A variant would be needed for net premium valuations. These are considered further below in 3.10 to 3.12

Illustration

The method described above can be illustrated using the example detailed in Appendix 4.

This example gives a 'cost' of 11.7% of fund at NRA.

The cost is obviously heavily dependent on the valuation basis used, the most sensitive assumption being the interest rate. A decrease in the valuation interest rate of 0.25% p.a. increases the cost by approximately 1.6% of fund. This implies that, for the example shown, the required additional reserve would increase to 18.3% of fund, if the valuation interest rate fell to 5% p.a.

Other sensitivities are given in Appendix 4.

For with-profits business the position is less clear. If reserves for with-profits business ignoring the guarantee are considered to be exactly appropriate, then additional reserves corresponding to a prudent expected cost of the guarantee are reasonable. Unfortunately, this is not always the case as reserving for with-profits business is not a precise science. Several recent papers from various working parties have looked at alternatives to net premium valuations and raise issues that are far beyond the scope of this paper. Adding in allowance for annuity guarantee reserves is another twist on top of a series of potential adjustments to standard net premium reserves.

Rather than offering recommendations on adjusting reserves at this stage, the Working Party has identified a number of possible approaches for consideration:

- i) Allow for guarantees in the same way as for unit-linked business by setting aside additional reserves related to prudent estimates of cost over and above existing, unadjusted with-profits reserves.
- ii) Recognise the cost of guarantees as effectively increasing the guaranteed sum assured on some prudent basis. Net premium reserves are then recalculated on this basis (effectively this can be viewed as being an increase in liabilities as per (i) partially offset by a reduction due to taking credit for an increased net premium).
- iii) Review whether and to what extent the guarantee will be covered by terminal bonus adjustments. Providing that terminal bonus adjustments will be used and are sufficient to cover guarantees in all circumstances, there is an argument for not reserving for such guarantees - no explicit provision is made for terminal bonuses and hence the provision for guarantees is simply part of this implicit provision subject to the existence of appropriate terminal bonus margins.

No approach is entirely satisfactory. The first approach is the most prudent. However, the adverse impact on published survey ratios for an office adopting this approach in isolation may make it

unattractive. The approach may also raise the need to consider whether, if payments for with-profits business are primarily based on asset shares, to what extent is it reasonable to allow statutory reserves to exceed aggregate asset shares? As noted above, answering this question is beyond the scope of this paper. The second approach appears rather arbitrary in its effect on the overall strength of the valuation basis. The third approach could be viewed as being unsound because no explicit provision is made for an explicit guarantee.

Impact on Resilience Reserves

The approach which is taken to reserving for annuity guarantees in a company's main valuation will also need to be carried into the calculation of the resilience reserves. The existence of a guarantee will change significantly the sensitivity of the reserves to changes in interest rates.

- 3.14 The effect of this is demonstrated in the example in Appendix 5. For a unit-linked contract, the reserve required when the valuation rate of interest is increased has a minimum of the current value of the fund. However, when the valuation rate of interest falls below the rate implied by the annuity guarantee, the reserve increases in line with the increasing annuity value.

For any contract where the basic reserves are calculated by rolling up the current benefit fund to retirement date at a guaranteed rate of return and discounting at a valuation rate of interest back to the current date, the variation of the reserves on different valuation interest rate bases is also affected by the presence of a guaranteed annuity option. Over a range of higher interest rates the value only varies in relation to the discounting of the retirement cash fund. However, when the valuation interest rate is lowered, as may be the case in a resilience test scenario, the value of the guaranteed annuity will come into play.

- 3.16 In practice, the resilience calculations may be more complex than this analysis may suggest. For example, a company may need to give further consideration to the likelihood of the guarantee being taken in each scenario, particularly if it only applies in restricted circumstances. On with-profits business, there may also be a need to review terminal bonus margins in each scenario if the company

has some intention of adjusting payouts when the guarantee is of value.

- 3.17 Finally, for many companies the high interest resilience scenario is currently the more significant. Unless the presence of annuity guarantees changes this position, then the overall reserving requirements may be unchanged by the existence of annuity guarantees.

4. *PRE ISSUES*

- 4.1 In this section we consider PRE issues, including those identified in the survey, as they affect all policies which offer annuity guarantees. We then consider issues specific to the with-profits business that forms the bulk of these policies.

General Issues

Many guarantees offered historically are specific in certain respects. Examples include:

- ♦ guarantee applies only at age 65/60 or only over a short period.
- ♦ guarantee is for a single life annuity with no reversionary element.
- ♦ guarantee relates to an annuity with no increases, monthly in advance payments and a five year guarantee.

The PRE issues raised by guarantees worded in this way revolve around whether and to what extent that guarantee should apply in practice. In increasing order of generosity to the policyholder answers might be as follows:

- ♦ At the age and date specified and in the form specified only.
- ♦ In a short period around the formal exercise date, say within one month, to allow for administrative delays.
- ♦ To any selected annuity (including reversions, allowing for increases, etc.) on an equivalent basis to that implied by the guarantee.

- ♦ To all policies reaching retirement, whether early or late, on an equivalent basis.
- ♦ To transfers.

4.4 Different offices are likely to have different approaches to this question influenced both by type of business (unit-linked versus with-profits) and by who pays (shareholders versus with-profits policyholders). The survey requested comments on PRE issues but there were relatively few comments in these areas. As annuity guarantees bite, offices will clearly have to develop their own response in the near future, including whether and how to communicate with policyholders to explain the nature of the guarantees. Policy is also needed on communicating the implications of retiring in a way which loses the benefit of a valuable guarantee.

With-Profits Business

4.5 With-Profits business raises additional PRE issues revolving around the way in which any cost of annuity guarantees should be met. Assuming that maturity payouts are in some way related to asset shares (a practice that now appears to be almost universal), the office's approach to spreading of costs across generations and across policy types is likely to be of most significance. A range of approaches is possible tending towards one or other of the following:

- Offices that aim to return to policyholders the proceeds distributable to that generation of policyholders will tend towards adjusting the maturity proceeds of each generation of policyholders to recognise the costs of annuity guarantees for that generation. Adjustments could be implicit through charges on asset shares or explicit through adjustments to terminal bonus rates.
- Offices that consider the costs of annuity guarantees to be part of a general guarantee cost would more naturally respread such costs over generations of policyholders either as part of an explicit charge for guarantees built into the asset shares or as allowing such losses to be met from the estate.

4.6 A summary of responses to the survey is given in Appendix 2. The majority of offices make no allowance at present. One interpretation of this stance is that, as costs have not been material to date, offices' approaches have not been fully developed and will be adjusted in future should guaranteed costs become material - this was certainly indicated in a number of responses. Other offices who make no adjustments are effectively adopting approach (b) by charging costs as and when they arise to their estate, thus spreading such costs over all current and future generations of with-profits policyholders.

4.7 Comments in the survey were varied. For example, there were some mentions of any allowance for guarantees in payouts being contrary to the spirit of those guarantees and hence contrary to PRE. This was particularly associated with adjustments to terminal bonuses only as and when guarantees bite. Other offices practice, or intend to consider exactly this approach.

4.8 Each office needs to frame its own response to this issue which will recognise its own resources and history and, indeed, whether it even has a problem. Consideration of some following questions may be of assistance in this process.

- ♦ What is the likely cost of guarantees, is this material and what is the sensitivity of the cost to changes in future conditions?
- ♦ Should the costs of any guarantee be spread beyond the policies being affected by that guarantee?
- ♦ If part of the reason for the guarantee biting is that the stockmarkets are exceptionally high, giving high maturity proceeds, should this have any impact?
- ♦ If spreading of guaranteed costs is felt to be part of the with-profits nature of the policy, over which policies should these be spread? The possibilities are:
 - pensions endowments with guarantees;
 - all with-profits pensions business; and
 - all with-profits business.

Each category could be further split into:

policies written during the period when guarantees were offered;
policies maturing or in-force when guarantees bite;
and
all with-profits policies.

- ♦ Should any costs be charged explicitly to asset shares or by adjusting terminal bonus rates, or implicitly against the estate?

5. *STOCHASTIC METHODS*

In section 3, consideration was given to the cost of guarantees on various interest and mortality bases and the implications for reserving according to the established methods of statutory reserving. In this section we consider the impact of variable interest rates on the cost of guarantees using a stochastic model.

The model used is the Wilkie 1995 version. The model was initialised with a starting irredeemable Gilt rate of 7% and cash rate of 6½% corresponding broadly to market conditions at end July 1997 and with long term assumed irredeemable Gilt rates of 5%, 6%, 7% or 8%.

For each long term rate one hundred scenarios were generated, each projecting 15 years into the future.

- 5.3 The Wilkie model does not currently generate a term structure for interest. Therefore for this investigation, the irredeemable Gilt rate generated each year was used to calculate the cost of the annuity guarantee (as a percentage of the fund) for maturities in that year. Other elements of the basis are the same as the standard reserving basis throughout. The resulting percentile graphs are shown in Appendix 6. These graphs demonstrate the spread of maturity costs at each yearly date from the 100 scenarios.

- 5.4 An alternative analysis is to calculate separately for each scenario the average cost of the guarantee over the 15 years using an assumed pattern of maturities. The pattern taken was to assume an equal amount of fund maturing each year. These average costs as a

percentage of current reserves can be ranked to produce the following percentiles:

Long Term Gilt Rate	Average Cost	25th Percentile	50th Percentile	75th Percentile	80th Percentile	90th Percentile	95th Percentile
5%	12.42%	7.52%	11.46%	16.72%	17.96%	21.78%	24.08%
6%	8.36%	4.52%	7.08%	12.30%	13.37%	15.42%	18.58%
7%	6.61%	2.48%	5.59%	9.22%	11.28%	13.94%	16.65%
8%	5.29%	2.07%	4.45%	7.94%	8.43%	9.45%	10.24%

5.5 Notable features of this analysis are:

As expected the year by year projections all start from an additional reserve of 5.8% (consistent with the standard reserving basis at 7% interest- see Appendix 4 Sensitivity (ii)).

After year 10, the year-by-year percentiles seem broadly stable for assumed long term yields of 6-8%, but are still diverging on the 5% long term yield. This appears to be because of the very long period over which the model regresses towards the long term assumption.

The 7% long term yield is, in a sense, the neutral assumption in relation to market conditions at year zero. The initial valuation reserve on this basis (5.8% of the fund) is broadly equal to the 50% percentile for the full 15 years. Similarly the 50% percentile of the average cost over 15 years is almost exactly 5.8%. The average of the average costs is a little higher (6.6%) because the distribution of values is skewed by the floor of zero cost.

- (d) Again taking the 7% long term yield results, the resilience reserve at year zero for the annuity guarantee in isolation would be calculated at 5.6% and would therefore be 14.2% of the fund. A reserve at this level would cover the average cost of 90% of the scenarios.

The average cost of the guarantee over the 15 years is much less sensitive to the long term rate of interest assumed than a traditional reserve calculated on the same long term rates of interest.

6. *USE OF FINANCIAL INVESTMENTS TO HEDGE GUARANTEES*

6.1 An alternative approach to the annuity guarantee issue might be to use financial instruments to protect the Fund against the impact of guarantees, either by eliminating the interest rate risk or by setting an upper limit on the risk.

A promising approach appears to be to purchase an option to swap floating rate interest payments for a fixed rate payment at a specified date for a specified period.

6.3 In this context, the date would be the anticipated retirement date of the policyholder and the period would be related to the expected duration of the annuity. The fixed rate would be the rate of interest underlying the annuity guarantee on the assumed mortality. Such an instrument would give the company the option at maturity to put the maturity proceeds on deposit and swap the interest received for fixed interest payments equal to the rate required to support the guaranteed annuity.

6.4 The example explored in more detail is as follows:

Floating rate payment: LIBOR

Fixed rate received: 7% or 8%

Exercise date: 1, 5, 10 or 15 years from purchase of the option

Term of swap: 15 years from date of exercise

There exists a very large liquid market for trading such 'swaptions' particularly at the shorter dates. Illustrative prices for the options as at the end of July 1997 were obtained as follows:

Guaranteed Fixed Interest rate	Period to exercise	
	1 year	10 years
7%	2.2%	4.6%
8%	7.3%	7.4%

The price quoted relates to the nominal amount of capital on which the option may be exercised e.g. If the nominal amount is £1m, the price of the option would be based on this figure, as would the interest payments swapped.

Swaptions of this sort are not a perfect match for the guaranteed annuity liability. The most significant issue is that the nominal amount to be purchased will depend on the assumed growth rate of the policyholder's fund. There cannot be any certainty as to whether too little or too much has been purchased. In addition

- (a) the policyholder may be able to choose his retirement date within a range of ages
- (b) the term of the annuity and the fixed term of the swaption will not correspond exactly
- (c) the company may not be able to achieve the full LIBOR rate, and the fixed rate received is subject to a credit risk
- (d) the company will probably have liabilities maturing beyond 15 years when swaptions may not be available.

Nevertheless, they do give an indication of the market's view of the value of the annuity guarantee.

For example assume:

- (a) £15m of reserves assumed to mature evenly over the next 15 years.
- (b) Market conditions at the date of purchase of the swaption include 7% long term gilt rates.
- (c) Prices for swaptions as in 6.5; swaptions purchased to achieve 7% fixed rate on each year's maturity outgo.
- (d) Ignore all the issues in 6.6, but assume that reserves grow at 7% per annum.

The cost of the swaptions would be approximately 4% of the maturity proceeds or equivalently 7½% of the initial reserves. In addition the cost of the annuity guarantee at 7% would be an

additional 5.8% of the reserves, giving a total cost of about 13% to eliminate the possibility of a loss from the annuity guarantee.

Comparison of this 13% figure with the results of the stochastic modelling in section 5.4 is interesting. An initial reserve of 13% would cover the average cost on around 80-90% of the scenarios. A surplus would arise on the majority, a strain on the remaining 10-20%.

The cost of swaptions to fix into an 8% interest rate would be approximately 13% of the initial reserve. Fixing into 8% would remove the need for an additional valuation reserve, and would give rise to a small profit to the company in those maturities when interest rates were between about 7.75% (when the annuity option is not worth exercising) and 8% (when opting to swap ceases to be worthwhile). The two costs (in 6.7 and 6.9) therefore appear comparable.

The work in this section has taken a limited view of the use of financial instruments to hedge annuity guarantee. The swaptions considered could presumably be developed further to meet the company's needs more closely. The most obvious use would appear to be to protect the company's position if it was expecting a heavy maturity outgo over a relatively short time period. In this situation it might also be possible to combine the swaption with other options to hedge the impact of higher than expected investment performance up to maturity as well.

7. *CONCLUSIONS*

7.1 Annuity guarantees apply to just over 10% of the liabilities of the companies responding to the survey, which account for over 90% of the total industry liabilities.

The future cost of the guarantees will depend on interest rates and on the future mortality of pensioners, particularly the rate of improvement.

7.3 It will also depend on the way companies apply the guarantee in practice, particularly the extent to which companies draw policyholders' attention to the guarantee and the conditions under which it is available.

7.4 On with-profits business, companies also have the opportunity to take account of guarantees when setting bonus rates. This may reduce the cost of guarantees, but may raise PRE issues for the company.

However, there is only limited evidence that companies have started to address the issues in 7.3 and 7.4. We consider that they will need to do so in the relatively near future.

Assuming that companies do not decide to extend the application of guarantees significantly and take some account in setting bonus rates, then a sensible range under current conditions for the industry-wide cost of guarantees currently in force might be 0-20% of liabilities of £5-10bn. The impact on some individual companies will be more significant.

There is no industry consensus on reserving for guarantees, and current practice is very varied. It appears that many companies have not yet worked out their approach to reserving for these guarantees, but with low interest rates and improving mortality they will need to do so in the near future.

We have considered whether it is possible to recommend an approach to reserving. However, the variation between products and between the approaches of different companies to managing the guarantees is so great that we have felt unable to do so.

RESEARCH INTO ANNUITY GUARANTEES

Terms of Reference

1. *Background*

Many older pensions policies include an option to convert the maturity fund into an annuity at retirement on rates guaranteed at outset. Although the terms of the annuity guarantee appeared originally to be conservative, falling interest rates and improving annuitant mortality have made it more likely that they will be taken up by the policyholder.

Currently there is no accepted practice for reserving for these guarantees and there is no published research to guide Appointed Actuaries in setting reserves. The DTI have not published any guidance or regulations specific to annuity guarantees.

2. *Objectives of the Working Party*

(a) to determine the different types of annuity guarantee which have been given by Life Offices and indication of volumes of business.

to determine current practice to reserving for the guarantees.

(c) to conduct research into the cost of such guarantees under different scenarios of investment returns and annuitant mortality, using both stochastic and deterministic techniques.

(d) to consider PRE issues in relation to such guarantees on with-profits policies.

to consider and recommend appropriate reserving bases for annuity guarantees, taking account of general DTI guidance and regulations.

(f) to prepare a report summarising the research and its conclusions.

3. *Publication*

It is anticipated that the results of the research will be published:

- (a) by placing the report in the Institute's Library and making copies available on request.
- (b) by an article summarising the results in *The Actuary*.
- (c) by running a workshop on the subject at the 1997 Life Conference.

4. *Membership of the Working Party*

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5. *Timetable*

The 1997 Life Conference is to be held 30 November to 2 December 1997.

QUESTIONNAIRE RESULTS IN DETAIL

Section 1

1. Does your Insurance Company/Friendly Society have pensions contracts in force which have an annuity guarantee?

Yes	41 insurance companies or groups of companies.
No	25

(No response to questionnaire 19)

Responses to the remaining questions apply only to those companies replying 'Yes' to Q1.

Section 2 - Base Data

- 2.1 What is the effective date of the date in this questionnaire?

Year end 1996	35
Other	5

- 2.2 What are the total long term liabilities for your insurance company/group?

£303.9 bn

What are the total long term business admissible assets for the company/group?

£370.0 bn

Section 3 - Information relating to pension products with an annuity guarantee

Total number of products identified	117
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Product Classification

Product Classification		Proportion of liabilities for contracts with guarantees.
Traditional Business (mostly with-profits)	- Individual	60.0%
	- Grouped Individual	11.8%
	- Other Group	8.5%
Total Traditional		80.2%
Unit Linked and UWP	- Individual	13.9%
	- Grouped Individual	2.1%
Total Linked		16.0%
Other		3.8%
Total		100%

When Sold

	Number of Contracts	
	Start Date	End Date
Before 1970	13	0
1970 - 1974	36	2
1975 - 1979	26	10
1980 - 1984	25	13
1985 - 1989	10	46
After 1990	1	35
Still sold	-	11
No data	6	-
Total	117	117

Guaranteed annuity rate for Male age 65

Guaranteed cost per £1 pension	Equivalent Annuity per £1000 Fund	Number of contracts
Less than 8.25	More than £121	2
8.25 - 8.75	£114 - £121	3
8.75 - 9.25	£108 - £114	46
9.25 - 9.75	£102 - £108	12
9.75 - 10.25	£ 97 - £102	24
10.25 - 10.75	£ 93 - £ 97	10
10.75 - 11.25	£ 89 - £ 93	5
11.25 - 11.75	£ 85 - £ 89	0
Over 11.75	Less than £ 85	4
None stated		11
Total		117

Application of Guarantee

	Number of contracts
Specified Retirement age only	50
Range of ages with some restriction	24
Retirement at any age	40
Within a limited period from start of policy	3
Total	117

3.6 Is the Guarantee given to:

	Number of Contracts			N/A	No response
	Yes	No	Limited Period		
Regular premiums paid at initial level	97	0	3	11	6
Increments	75	12	3	21	6
Single Premium	95	5	3	8	6
New Members	52	15	3	41	6

Total mathematical reserves for products with annuity guarantees **£34.6 bn** (i.e. 11% of the companies' total liabilities)

Reserves for annuity guarantee included within 3.7 - **£1.4 bn**

Section 4 - Approach to reserving for annuity guarantees

For the purpose of analysis, we investigated whether a company's approach to reserving was influenced by the level of guarantee given. The table below analyses the liabilities by the guaranteed cost of £1 of pension and whether or not the company stated that it made a reserve for the guarantee. The figure in brackets is the number of companies contributing to the cell; as might be expected, companies may contribute to more than one cell:

Male age 65 Range of guaranteed cost per £1	Proportion of liabilities for contracts with guarantees	
	with reserve for guarantee	without reserve for guarantee
Less than 8.25	0.8% (2)	-
8.25 - 8.75	-	9.9% (1)
8.75 - 9.25	29.6% (12)	16.1% (8)
9.25 - 9.75	1.9% (4)	3.4% (4)
9.75 - 10.25	2.1% (4)	7.6% (9)
10.25 - 10.75	6.9% (2)	4.0% (3)
10.75 - 11.25	0.8% (1)	2.2% (3)
11.25 - 11.75	-	-
Over 11.75	1.3% (1)	6.1% (2)
None stated	5.6% (4)	1.7% (6)
Total	49.0% (30)	51.0% (36)

There seems to be little indication from this table that those companies offering the more onerous guarantee are more likely to set up a reserve for the guarantee.

Section 5 - Other Issues

The questions affecting with-profits business were as follows:

On with-profits contracts, do you make specific allowance for the annuity guarantee when calculating asset shares?

On with-profits contracts, would you consider reducing terminal bonus rates to compensate for a guarantee which was biting?

Positive answers can be categorised into the following four groups:

		Adjust Terminal Bonus scale	
		Yes	No
Allowance in Asset shares	Yes	1	3
	No	3	22

- 5.3 This question asked whether the existence of annuity guarantees affected investment policy. 25 of the 29 offices referred to above stated that it did not. 3 of the 4 positive responses referred only to incorporating the cost of the guarantees in to their general asset liability modelling in setting overall investment criteria for their with-profits funds. One office explicitly adjusted the investment mix backing with with-profits business with annuity guarantees (increasing fixed interest cost content). This office appears in the 'no/no' category above, albeit that asset shares will be affected for this category of policies by the revised investment strategy.

RATES OF INTEREST IMPLIED BY ANNUITY GUARANTEES

Table 3.1

For a male retiring at age 65 with a level annuity payable monthly in advance and guaranteed 5 years, this table shows the implicit interest rate guaranteed on various assumptions of mortality for two GAO rates. (Expense loading of 2 % of annuity included.)

Mortality Basis	GAO Rate per £1000 cash	
	£100 p.a.	£111 p.a.
a(55) Ultimate	5.1% p.a.	6.7% p.a.
a(90)	5.8% p.a.	7.3% p.a.
a(90) - 4	7.0% p.a.	8.5% p.a.
PA(90)	5.2% p.a.	6.8% p.a.
PA(90) - 4	6.6% p.a.	8.1% p.a.
PMA80 (C=2010)	6.6% p.a.	8.2% p.a.
PMA80 (C=2010) - 2	7.3% p.a.	8.8% p.a.
IM80 (C=2010)	6.8% p.a.	8.4% p.a.
IM80 (C=2010) - 2	7.4% p.a.	8.9% p.a.

Table 3.2

For a male retiring at age 65 with a level annuity payable monthly in advance and guaranteed 5 years, this table shows the change in the implicit interest rate guaranteed for two GAO rates as mortality improves by considering age ratings or percentage changes against the basic a(55) table. (Expense loading of 2 % of annuity included.)

Mortality Basis	GAO Rate per £1000 cash	
	£100 p.a.	£111 p.a.
a(55) Ultimate	5.1% p.a.	6.7% p.a.
a(55) Ult. - 1	5.5% p.a.	7.1% p.a.
a(55) Ult. - 2	5.9% p.a.	7.5% p.a.
a(55) Ult. - 3	6.3% p.a.	7.8% p.a.
95% of a(55) Ult.	5.3% p.a.	6.9% p.a.
90% of a(55) Ult.	5.5% p.a.	7.1% p.a.

Table 3.3

For a male retiring at age 65 with a level annuity payable monthly in advance and guaranteed 5 years, this table shows the change in the implicit interest rate guaranteed for two GAO rates as mortality improves over time in line with PMA80 tables. (Expense loading of 2 % of annuity included.)

Mortality Basis	GAO Rate per £1000 cash	
	£100 p.a.	£111 p.a.
PMA80 (U=1980)	5.9% p.a.	7.5% p.a.
PMA80 (U=1990)	6.3% p.a.	7.9% p.a.
PMA80 (U=2000)	6.6% p.a.	8.1% p.a.
PMA80 (U=2010)	6.7% p.a.	8.3% p.a.

Table 3.4

For a male retiring at age 65 with a level annuity guaranteed for 5 years, this table shows the change in the implicit interest rate guaranteed for two GAO rates for different frequencies of payment. (Mortality a(55) Ult.; expense loading 2%)

Annuity Frequency	GAO Rate per £1000 cash	
	£100 p.a.	£111 p.a.
Annually in Advance	5.8% p.a.	7.5% p.a.
Monthly in Advance	5.1% p.a.	6.7% p.a.
Monthly in Arrears	5.0% p.a.	6.5% p.a.
Annually in Arrears	4.4% p.a.	5.9% p.a.

Table 3.5

For a male retiring at age 65 with a level annuity payable monthly in advance , this table shows the change in the implicit interest rate guaranteed for two GAO rates as the guarantee period is increased. (Mortality a(55) Ult.; expense loading 2%)

Annuity Guarantee Period	GAO Rate per £1000 cash	
	£100 p.a.	£111 p.a.
None	4.7% p.a.	6.3% p.a.
5 years	5.1% p.a.	6.7% p.a.
10 years	6.2% p.a.	7.8% p.a.

Table 3.6

For a male retiring at age 65 with a level annuity payable monthly in advance and guaranteed 5 years, this table shows the change in the implicit interest rate guaranteed for two GAO rates as the expense loading is increased. (Mortality a(55) Ult.)

<i>Expense Loading</i>	<i>GAO Rate per £1000 cash</i>	
	<i>£100 p.a.</i>	<i>£111 p.a.</i>
Nil	4.8% p.a.	6.4% p.a.
2%	5.1% p.a.	6.7% p.a.
4%	5.4% p.a.	7.0% p.a.

RESERVING RESULTS IN DETAIL

Methodology Used

Project fund to NRA on realistic basis.
Obtain projected guaranteed annuity
Calculate reserve required at NRA for that guaranteed annuity
Compare reserve with projected fund
If reserve is greater than projected fund then establish cost of guarantee as a percentage of projected fund.

Standard Case

Male ANB 30, NRA 65
Mortality in deferment: A67/70
Mortality in retirement : PMA80(c2010)
25% Tax Free Cash Sum taken at retirement
Guaranteed level annuity of £111 p.a. for every £1,000 fund, payable monthly in advance and guaranteed for a period of 5 years. (This is equivalent to the commonly found 9:1 factor).
Valuation Interest Rate at NRA assumed to be 6% p.a.
Expenses : 2% of annuity

The fund was projected at 6% p.a. (net of expenses), giving a projected fund at NRA of £95,339 and a subsequent guaranteed annuity of £7,937 p.a.

The reserve required was calculated on the above basis as £106,464. This implies a reserve of 11.7% of the projected fund is required to cover the annuity guarantee.

The sensitivities shown overleaf are based on this standard case.

Sensitivities

The following sensitivities have been investigated:-

i) Guaranteed Annuity Rate

<i>Guaranteed Annuity Rate per £1000 Fund</i>	<i>Reserve Required as % of Projected Fund</i>
100	3.1%
105	7.0%
110	10.9%
111 (standard case)	11.7%
115	14.8%
120	18.7%

ii) Valuation Interest Rate

<i>Valuation Interest Rate</i>	<i>Reserve Required as % of Projected Fund</i>
5.00%	18.3%
5.25%	16.6%
5.50%	14.9%
5.75%	13.3%
6.00% (standard case)	11.7%
6.25%	10.1%
6.50%	8.6%
6.75%	7.2%
7.00%	5.8%

iii) Frequency of Annuity

<i>Frequency</i>	<i>Reserve Required as % of Projected Fund</i>
Annual in Advance	15.3%
Monthly in Advance (standard case)	11.7%
Monthly in Arrears	11.0%
Annual in Arrears	7.4%

iv) Tax Free Cash Sum Percentage

<i>Tax Free Cash Sum %</i>	<i>Reserve Required as % of Projected Fund</i>
0%	15.6%
10%	14.0%
25% (standard case)	11.7%
30%	10.9%

v) Guaranteed Period Assumption

<i>Guaranteed period (years)</i>	<i>Reserve Required as % of Projected Fund</i>
0	10.4%
5 (standard case)	11.7%
10	15.6%

vi) Mortality

<i>Mortality Tables</i>	<i>Reserve Required as % of Projected Fund</i>
IM80(c2010)	13.2%
IM80(c2019)(x-1)	15.3%
IM80(c2010)(x-2)	17.3%
.95IM80(c2010)	14.4%
IM80(c2000)	11.7%
IM80(c2005)	12.6%
IM80(c2020)	14.2%
a(90)(x-3)	13.0%
a(90)(x-2)	11.1%
a(55)(x-3)	10.0%
PA(90)(x-4)	12.0%
PA(90)(x-3)	10.1%
PMA 80(c2010)(x-1)	14.0%
PMA80(c2010) (standard case)	11.7%
PMA80(c2010)(x-2)	16.2%
.95PMA80(c2010)	12.8%
PMA80(c2000)	10.2%
PMA80(c2005)	11.0%
PMA80(c2020)	12.6%

IMPACT OF THE RESILIENCE TEST

Consider a product, with a current fund amount of £50,000 at age 55, on which there is a Guaranteed Annuity Option of £100 p.a. (payable monthly in advance and guaranteed for 5 years) for each £1,000 cash at age 65. The statutory valuation basis is IM80(C=2010) at 6% p.a.

Unit-linked contract

If the fund investment is unit-linked, the basic valuation reserve (assuming investment in matched assets and ignoring sterling reserves) will be the current fund amount of £50,000. In addition there will be a loading of 3.7% or £1,844, because the value of the guaranteed annuity at 6% p.a. is slightly higher than the cash value.

In a resilience test scenario where we need to increase the valuation rate of interest to 7.5% p.a. the basic reserve will simply change to whatever the asset value has become in the particular scenario under consideration, but the additional loading disappears because the annuity value has fallen below the value of the cash fund.

In an alternative scenario, where we consider the effect of a reduction in the valuation interest rate to 4.5%, the basic reserve alters in line with the change in asset values, since investment and liability are fully matched, but the loading required for the Guaranteed Annuity Option rises to 16.8% of the basic reserve, because the annuity has now become significantly more valuable than the cash alternative.

With-profits contract

If the contract is a with-profits contract with a guaranteed rate of accumulation of the fund of 4% p.a., the accumulated cash fund (on the guaranteed basis) at age 65 amounts to £74,012, on which the Guaranteed Annuity Option would be £7,401 p.a.

On the statutory basis the current reserve for the cash fund is £41,328 but, since the value of the annuity option on this basis is slightly more than £10 for each £1 p.a. annuity, there is an additional reserve of £1,524 (3.7%) required for the guaranteed annuity option.

If, in the high interest rate resilience test, we wish to move the valuation rate of interest to 7.5% p.a., the basic reserve for the cash fund reduces

from £41,328 to £35,910 - a fall of 13.1%. However, the additional reserve for the GAO disappears altogether, giving an overall reduction in reserve from £42,852 to £35,910 - a fall of 16.2%.

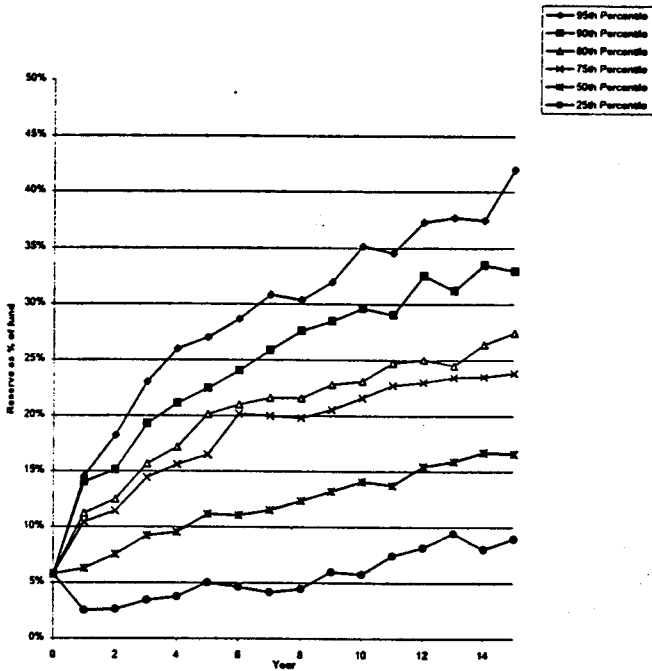
In the alternative scenario, where we are considering the effect of a reduction in the valuation interest rate of 4.5% p.a., the reserve for the cash fund increases to £47,658 - a rise of 15.3%, but we now have to consider the increased value of the annuity option:

$$11681 \times 7,401 = £86,451 \text{ at age 65,}$$

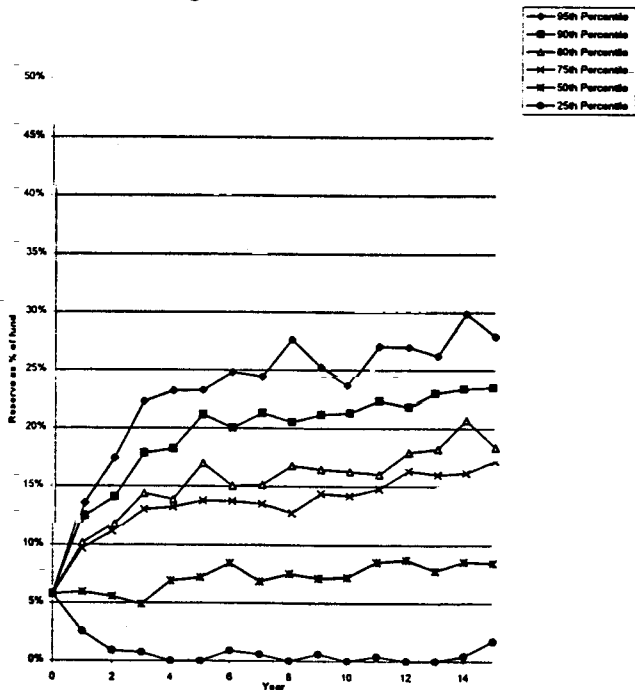
giving a current total reserve of £55,668 - an increase of 29.9%.

Appendix 6

5% Long Term Assumed Yield

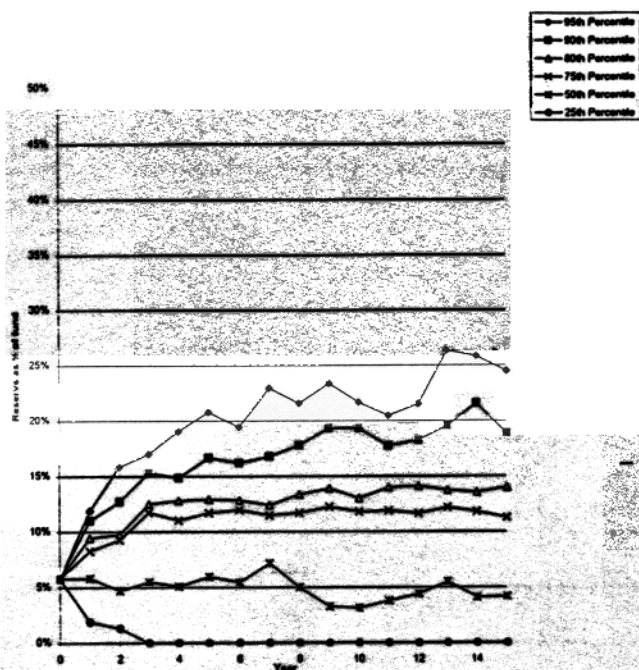


6% Long Term Assumed Yield



Appendix 6 (cont.)

7% Long Term Assumed Yield



8% Long Term Assumed Yield

