

# **EXAMINATIONS**

September 2002

**Subject 402 — UK Fellowship Life Insurance**

**Paper One**

## **EXAMINERS' REPORT**

### **Introduction**

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The examiners are mindful that a number of interpretations may be drawn from the syllabus and Core Reading. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

The report does not attempt to offer a specimen solution for each question — that is, a solution that a well prepared candidate might have produced in the time allowed. For most questions substantially more detail is given than would normally be necessary to obtain a clear pass. There can also be valid alternatives which would gain equal marks.

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Chairman of the Board of Examiners

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- 1** Check that don't already defer the acquisition costs in respect of some of the contracts via the valuation methodology, e.g. actuarial funding of capital units or by holding a Zillmer reserve.

Perform an expense analysis to identify which expenses can be classed as acquisition, and to split these between types of business.

Compare DAC asset with value of future expected margins to ensure recoverability.

Perform experience investigations in order to determine appropriate basis for the recoverability tests (eg persistency rates).

Appropriate adjustment will be made for the deferred tax DAC asset.

**2 (i) Equating present values**

This is a formula approach. The future benefits, premiums and expenses are all discounted to the start of the contract using the pricing assumptions and commutation functions.

The premium required for the policy is such that the present value of the future premiums less the present value of future expenses equates to the present value of future benefits.

Profit is implicitly allowed for by margins in the elements of the basis.

The method is often used for conventional with profits contracts because the flexibility added by variable bonuses can be used to make allowance for the required profit for shareholders.

If the bonus system is used to set payouts in relation to asset shares, detailed accuracy in the pricing is not important.

Equating present values is relatively less complicated.

**Emerging costs**

This method also involves discounting future income and outgo streams to the start of the contract.

However, the elements of income and outgo are calculated for each future time period (which may be a month or a year), and then discounted.

A profit criterion is set and the premium is determined such that the discounted value of all the cash flows equals the profit criterion.

The method requires computing power.

- (ii) With the current easy availability of computing power the equating present values approach is virtually obsolete and is unlikely to be used.

The benefits of the emerging costs approach are that:

- It enables the company to measure the expected return that the providers of capital will receive.
- The sensitivity of profit to variations in experience can be tested. Variables in the contract design can be adjusted to minimize this sensitivity.
- The need to set up reserves and solvency margins can be included explicitly.
- By building a new business model from a range of specimen policies, the financing requirements of a new contract can be determined.
- The method allows more easily for withdrawals, with or without a surrender payment, and conversions to paid-up.
- It can cope more easily with complex charging and benefit structures, in particular where charges and benefits depend on future assumptions.
- It is easy to incorporate assumptions that vary over time, or stochastic assumptions.
- The risk discount rate can vary with term.
- Tax can be allowed for exactly rather than by reductions in the parameters.

- 3** (i) The value of the in-force business will be based on an embedded value calculation.

This is the calculation of the present value of the future transfers to shareholders.

Since the mutual will be closed to new business, no goodwill will be paid for the value of future new business.

The company will decide on a set of model points that it feels are representative of the mix of existing business.

Alternatively, it may value the policies individually since the company being valued is small.

The transfers to shareholders are directly related to the cost of bonus.

To calculate the EV it is therefore necessary to make projections of future reversionary and terminal bonus rates.

One possibility would be to assume that the current bonus rates remain unchanged into the future, after allowing for any special bonus to be allocated at the time of the purchase.

Alternatively, the company may use the bonus rates that, on a best estimate basis, would result in the earned asset share being paid out at maturity.

This would require best estimate assumptions about the future investment returns that will be earned, expenses, and other experience items.

It also requires an assumption about the future balance of bonus between reversionary and terminal.

This will be based upon the past bonus philosophy of the mutual company so as to take into account policyholders' expectations.

The value of the in-force business to the shareholders is then  $1/9$  of the cost of the projected reversionary bonus and terminal bonus discounted to the present day at the chosen risk discount rate.

The value of the reversionary bonus is based on the statutory valuation basis

So an assumption will need to be made about the degree of prudence in this basis in future

Consideration then needs to be given to the level of any free estate within the fund of the mutual

Since the company being purchased is a mutual, it is unlikely that the purchaser could argue that it could be allocated entirely to shareholders.

It is likely to be split in the same 90/10 proportion as the distributed surplus.

The projected bonus rates used in the EV calculation could be adjusted so that they extinguish the earned asset share plus the free estate by the time the last policy has matured

Alternatively, the value to the shareholders could be taken as  $1/10$  of the current market value.

The value of the mutual to the shareholders will also reflect the present value of the difference between the future expenses which will be charged to the asset shares of the policies of the mutual and the future expenses which the proprietary company expects to incur.

The proprietary company will aim not to reflect all future expense savings in the bonus rates of the mutual as its shareholders would then only receive  $1/10$  of the benefit of the savings. Its shareholders will receive the full benefit of any expense savings which are not reflected in the bonus rates.

There may be an additional benefit to the shareholders in that the purchase will increase the economies of scale within the combined company and therefore reduce the expenses per case of its existing business, hence increasing the value of this existing business.

The ultimate price paid will be a matter of negotiation and will make allowance for the transaction costs of the purchase.

- (ii) Two separate expense assumptions are needed, one for the expenses charged to the asset shares which will impact on the future bonus rates.

And one for the expenses which the proprietary company expects to incur in administering the business. This assumption is required in order to calculate the difference between the expenses it will charge to the with profits policies of the mutual and those which it will incur.

Asset share expenses:

The actual future expenses which will be charged to asset shares will be a matter for negotiation between the two companies with the conclusion being written into the terms of the deal.

The expenses are likely to be based on the recent expense levels of the mutual company.

Any higher expenses would not be consistent with policyholder expectations and may be considered unreasonable.

An assumption will also be required about the rate at which these expenses will inflate and this is likely to be based on consideration of the mutual's past experience alongside expectations of future RPI rates.

Expenses which will be incurred in administering the business:

- In general closed funds tend to incur higher expenses as business goes off the books and economies of scale are lost. However, since the proprietary company is following a strategy of purchasing several companies it will expect to benefit from economies of scale and achieve expense savings.
- The expense assumptions will be based on the current renewal expenses of the mutual.
- Less any admin inefficiencies that the proprietary company believes can be eliminated from the current admin procedures of the mutual.
- Less any expense savings that can be achieved from integration of shared departments, such as personnel, investment and actuarial, in the

proprietary company and the mutual. The investment saving may be reduced however if the investment strategy of the mutual is markedly different and is to be maintained.

The proprietary company is likely to base its assumptions about future expense savings from its experience of purchasing similar companies in the past.

An assumption will be required about the future levels of expense inflation and this will take into account the company's expectations about the future level of RPI.

It will also reflect the speed at which the company expects the existing business of the mutual to go off the books.

And the speed at which expense savings are expected to be realised.

Account will also be taken of any redundancy costs that are anticipated as a result of the takeover or any incentive payments necessary to retain key staff of the mutual in the period immediately after the takeover.

#### **4 (i) Quantification of the estate**

Split assets between unit-linked unit and sterling reserves and the remainder, allocated to the with profits business.

The value of the assets will probably be taken at market value.

PRE is likely to be assessed relative to asset shares.

Hence, the company will calculate the aggregate asset shares under in force with profits policies.

The company will then need to assess whether the aggregate asset shares are adequate to meet PRE.

For example, current pay-outs may exceed asset shares.

Either because of smoothing,

Or because of a decision to support pay-outs from the estate.

If so, a view is required as to how quickly pay-outs can be brought down to underlying asset shares.

This will depend on the company's past practice towards varying pay-outs. And the impact this has had on PRE.

The result may be a deduction from the estate to meet the cost of “overpaying” at maturity while pay-outs are being brought down.

The size of the deduction can be calculated using a deterministic approach, with best estimate assumptions.

Or a stochastic method.

The company may pay less than asset share on surrender.

If so, and the approach is to continue, the effect will be to augment the estate.

The amount can be estimated, again on a best estimate basis.

Although allowance should be made for any change in experience that might result from closing to new business.

Finally, the company will need to allow for any items not met from asset shares.

For example, the costs of closing to new business.

Turning to the present value of future profits from the unit-linked portfolio, this is calculated by setting a best estimate basis for future experience.

Comprising mortality, investment returns, withdrawal rates and unit costs.

Care should be taken over expense inflation.

Renewal expenses may fall on closing to new business.

Then rise as fixed overheads are spread over a declining portfolio of business.

The in force portfolio is projected over its remaining life.

Including setting sterling reserves on a suitable valuation basis.

Projected cashflows for each future year are derived.

Representing the excess of charges over costs, including any death or surrender benefits and transfers to or from the sterling reserves.

The cashflows are then discounted back at a suitable risk discount rate.

(ii) **Distribution of the estate**

Cash is unlikely to be possible, as it would make the policies non-qualifying.

Hence, the options are higher reversionary or terminal bonuses, or a special reversionary bonus.

A special reversionary bonus has the advantage of giving policyholders an identifiable benefit from distributing the estate.

But increases the guaranteed liabilities, reducing the free assets and hence the company's investment freedom.

Increasing reversionary bonuses also increases guaranteed liabilities but at a slower rate.

Such an increase might give the impression that the new level will be maintained and this will need to be taken into account when deciding the level of bonus.

Using terminal bonus is the least visible to policyholders, but maximises the free assets.

It also provides greater flexibility to adjust the amount being distributed.

This will be important if a large part of the total comes from the value of the unit-linked business and depends on future experience.

The company will therefore wish to investigate the sensitivity of the estate to changes in future experience.

The relative size of the amount being distributed is relevant.

A smaller amount is more likely to be distributed entirely through terminal bonus.

The timing of the emergence of the profits under the unit-linked policies also needs to be considered.

For example, if much of the value emerges several years in the future, the company may not have adequate free assets to allocate it to policies immediately as additional guaranteed bonuses.

It will therefore wish to project forward its statutory solvency position assuming different approaches to distributing the estate.

There will also be a problem if a significant amount of value from the unit-linked policies is projected to emerge after most of the endowment assurances have matured.

This may necessitate some form of financial reinsurance to convert the future profits into cash which can be distributed sooner.



If the need to retain statutory capital to support the unit-linked business is a problem, the company may consider selling the portfolio.

Ultimately, the company will wish to consider merging the long-term fund with another fund, as otherwise it will become too small to manage efficiently.

In summary, the company may choose a combination of methods, taking account of the attitude of the regulator to possible approaches.

Perhaps distributing part of the estate as a special reversionary bonus and the remainder through enhanced terminal bonuses.

**5** (i) NC1 profit is the total trading profit made by the company

It is defined as:

Increase in undistributed profit carried forward as shown in supervisory returns

Plus any transfers to shareholders

Minus any NC1 losses brought forward

Adjusted ("grossed up") for shareholders tax on the above.

If calculation is negative in any year, then NC1 profit is set to zero and the loss carried forward to be offset against future profits.

- (ii) The question calls for a numeric answer and so intermediate workings would not be necessary for full marks if the answer were correct. Explanations and intermediate numbers would assist in gaining some marks where the correct answer is not given.

This is particularly relevant in this question where candidates could legitimately have introduced grossing up for tax into the NC1 calculations. This follows from the core reading statement that 'This is a net of tax figure and must therefore be increased to allow for shareholders' tax. This latter adjustment is complex and knowledge of how it is done is not needed for this subject.' For simplicity the solution below ignores this tax angle but where candidates attempted to allow for this then due credit was given.

2000 Taxable income in the BLAGAB fund is  $2,200 - 700 = 1,500$ .

The Pension Fund taxable income is 0. You cannot offset pension case VI losses against life fund taxable income. Therefore the total company taxable income is 1,500.

The (150) of Pension Case VI losses will be carried forward to offset any Case VI surplus arising in 2001. We are told that there are no additional losses brought forward from 1999.

2001 taxable income in the BLAGAB fund is  $1,050 - 1,000 = 50$ . The taxable income in the pension fund is  $200 - 150 = 50$ . Therefore total taxable income = 100.

The taxable income calculated is split between the policyholders and the shareholders by reference to the NC1 profit for the respective years.

For 2000 the NC1 profit is 100 and for 2001 it is 350 (we are told that there are no NC1 losses brought forward from 1999).

Therefore, for 2000:

Company pays tax at 30% on 100 = 30

And tax at 21% on  $1,500 - 100 = 294$

So total tax charge = 324

For 2001

Company pays tax at 30% on 350 = 105

There is no policyholder tax due as taxable income is lower than the NC1 profit arising.

The company is now Excess E

- (iii) The company has moved from being taxed on an "I-E" to being taxed on a profits basis.

There are several possible reasons:

The surplus in 2001 may have been increased due to weakening of the valuation basis.

Increased release of supervisory reserves because of e.g. increased withdrawal profits

Investment gains in 2001 that do not fall into taxable income if there are capital losses carried forward from 2000.

Pensions new business may be lower in 2001 so profits not being reduced by new business strain.

If the company writes a lot of unit-linked business in the life fund then:

- Lower investment returns reduces "I" more than profits.

- Higher expenses are compensated for in the profits assessment by increased charges on the unit-linked contracts.

- 6** (i) The life insurance company will be seeking reinsurance to limit its exposure to adverse fluctuations in morbidity experience.

The insurer is a proprietary company, with shareholders, and hence the ability of the insurer to produce stable results — that do not fluctuate because of variations in morbidity experience — is likely to be important.

The reinsurance arrangement most likely to meet this requirement is a quota share arrangement, on original terms.

The reinsurance is likely to be written under treaty on an obligatory basis.

An experience refund may be included as part of the treaty terms, to encourage the insurer to manage the claims well, and hence recoup profits via the refund.

Due to the “group” nature of the product, there is significant catastrophe risk since, for example, a single event may injure a large number of employees who all work in the same location.

Therefore the insurer will seek catastrophe reinsurance.

The catastrophe reinsurance will be placed with a specialist reinsurer, most likely in the London Market, and will normally cover the insurer up to a pre-defined limit (in total and per life).

In practice this may be complex to administer since the total cost of a catastrophe is not known until the last claimant has returned to work.

The insurer and catastrophe reinsurer may agree a method for valuing an income protection claim at the time the claim commences, to determine the catastrophe liability.

The insurer might also utilise stop loss reinsurance if available at reasonable cost.

- (ii) The retention level chosen by the insurer will depend on a number of factors. In some cases, these factors will influence the insurer to have a higher retention limit and in some cases the factors will influence the insurer to have a lower retention limit.

The retention limit ultimately chosen will reflect the relative importance placed on each of these factors. The factors are:

- The company's experience at writing this line of business.

Since the company has not written income protection business before, it is likely that there will be a low appetite for retaining much of this business in-house.

The insurer will have some experience at underwriting, since it has a Group Life portfolio, but it does not have any past experience at underwriting income protection business.

The risk of selection will be less for group business than individual business, since the employer is likely to be providing the cover for all employees. However, the insurer is still likely to choose a low retention limit due to inexperience at writing this business.

In addition, the insurer will not have any experience of managing income protection claims and hence will want to share a significant proportion of this risk with the reinsurer, whilst it builds its expertise in this area.

- The retention level chosen may influence the level of services the reinsurer is prepared to offer.
- The company's retention on other products.

The insurer may wish to structure the treaty in a similar manner, to that in-force for its group life business. This may be to simplify systems requirements and simplify administration procedures.

- The insurer's existing relationship with the reinsurer.
- The average benefit level, the nature of future increases in sickness benefit and the expected distribution of claims.

These will all have an influence on the retention level chosen by the insurer. The larger the average benefit, then the lower the retention level the insurer is likely to seek.

Similarly, the wider the expected distribution of claims, the greater the risk of instability in profits due to the morbidity experience and hence the lower the retention level the insurer is likely to seek.

The nature of the future increases in sickness benefit, e.g. NAE increases or fixed percentages, will help to indicate the likely total size of claim liabilities and may have some influence on the retention level chosen, the lower the benefit increases, the higher the retention level likely to be chosen.

- The insurer's free asset ratio and ability to withstand variations in morbidity experience.

We are not told whether the insurer has a healthy, stable free asset ratio, or whether it is falling. The lower the free asset ratio, the greater will be the insurers need for stable results and hence there will be a greater need for a low retention limit.

This will be considered against the impact of different retention levels on the return on capital to the shareholders.

- The effect on the minimum required solvency margin of choosing a particular retention limit.

ICR 1994 specifies that the solvency margin for an income protection contract is 4% of the mathematical reserves.

This can be reduced to allow for reinsurance, by multiplying the result by a factor equal to  $(1 - (\text{mathematical reserves reinsured} / \text{gross mathematical reserves}))$ , subject to the factor having a minimum value of 0.85.

Hence if more than 15% of the business is reinsured, the insurer will not have the ability to fully reflect this in the minimum solvency margin calculation.

This forces the insurer to hold the same amount of capital to meet the RMSM, regardless of the reinsurance arrangement in place — and hence it may influence the retention level chosen by the insurer.

- The terms the reinsurer is prepared to offer, in particular the level of reinsurance commission, and how this varies as the retention level varies.

If the reinsurer is prepared to offer more generous terms as the amount of business retained decreases then this may influence the retention level chosen.

- The existence of a profit-sharing arrangement in the reinsurance treaty.

This may result in the insurer being happy to pass more of the risk to the reinsurer, i.e. have a lower retention limit, yet still being able to recoup some profits from the reinsurer should the book produce healthy profits.

In turn, the insurer will be incentivised, by the profit sharing agreement, to manage the income protection claims well. Hence both the insurer and the reinsurer benefit from the existence of the profit sharing arrangement.

(iii) The practical assistance that the reinsurer is likely to provide will include:

- Assistance with product design and marketing strategy.
- Assistance with setting the premium rates.

Given the insurers lack of previous experience, it is likely that the premium rates would be set by using risk rates from the reinsurer, loaded up to allow for the insurer's costs of capital, expenses and profit.

- Assistance with staff training.
- Assistance with scheme underwriting, including assistance in setting free cover levels, provision of underwriting manuals and the loadings to be applied to allow for risk factors, such as geographical location of employees in the schemes.
- Assistance with systems and policy documentation.

Reinsurers often have systems that have been developed in-house that they provide to their clients free of charge, or at reduced cost, to allow the insurers, for example, to manage income protection claims more effectively, or to assist with the automation of the underwriting process.

- Assistance with the management of income protection claims.

The reinsurer will offer practical help in enabling the insurer to set up procedures to ensure that claims are appropriately managed and monitored.

This may include the provision of access to healthcare professionals, such as occupational nurses, who will help to manage claimants back to work.

The reinsurer could also provide guidance on claims acceptance.

- Information regarding market trends.

The reinsurer is likely to have access to a large number of insurers' data and hence may be able to spot trends in the types and numbers of claim arising, and provide advice on any changes necessary in pricing bases.

E.g. In recent years there has been a growing number of claims arising due to stress in the workplace and reinsurers will have given advice to insurers on how to manage these types of claim and the impact that this trend should have on premium rates.

- 7** (i) Change in the value of "free assets" in the long term business fund, arising from investment earnings and transfers to/from assets backing policyholder liabilities.

Earnings on shareholders fund assets.

Unwind of risk discount rate.

Value of new business added in the year.

Differences arising between actual transfer to shareholders in the year, and expected value in previous years value of future profits.

Such changes may be further analysed into.....

Actual vs expected bonuses.

Actual vs expected investment returns on assets backing policyholder liabilities.

Actual vs expected persistency.

Actual vs expected mortality.

Actual vs expected maintenance expenses.

Changes to statutory valuation bases.

Other miscellaneous sources of profit (e.g. change in proportion of distributed surplus being allocated to shareholders).

Differences between the actual value of in-force at the end of the year, and expected as a result of variances in the above items.

Changes in the value of in-force at the end of the year arising from changes to the assumptions used.

- (ii) In the absence of any other factors, the embedded value between one year-end and the next will change by a weighted average of the unwind of the discount rate, and the rate of return earned on the surplus as it emerges from the in-force.

When the scheme was originally set up, this natural rate of growth would therefore have been of the order of 10% per annum (i.e. some weighted average of 13% and 7.5%).

It therefore appears to be the case that the scheme was originally designed to reward achieved embedded value growth in excess of the natural rate.

On the current basis, the natural rate of embedded value growth is likely to be considerably lower — perhaps of the order of 6.5% per annum.

Therefore, it should be more difficult in future to achieve the current threshold rate than was originally intended — raising the threshold will reduce the likelihood of the scheme paying out further.

A significant proportion of the most recent years embedded value growth has arisen from assumption changes. The extent suggests that the assumptions contained significant margins, and that these have largely been removed, so that similar returns from this source are unlikely in future.

If anything, the above reasoning suggests that the threshold for the scheme should be reduced rather than increased.

But given that the suggestion is presumably being made on cost grounds, then the scheme rules should be revised to exclude “exceptional” profits arising from items such as changes in assumptions from the bonus scheme calculations.

- (iii) The starting point would (obviously) be a full analysis of the change in embedded value for the most recent year.

This should include a full analysis of surplus.

The analysis of surplus could help to highlight areas where current experience is better than the assumptions in the embedded value calculation.

It may also highlight items of one-off profit.

The extent to which there is scope for exceptional profits to arise from demographic assumption changes in the future depends on the margins remaining within them. Hence one would also need the most recent analysis of experience of each basis item, highlighting both current level and recent trends.

Analyses will be required for persistency, mortality and morbidity.

To some extent, the analysis of surplus may conflict with the experience analyses. For example, if persistency is actually worse than assumed in the calculation of the value of shareholders' profits, then more surplus may arise in the short term as a result of the release of reserves.

Should also consider most recent expense investigations, split by acquisition and maintenance.

Changes in the assumed level of per policy maintenance expenses will be capitalised in the value of future shareholders' profits, and so it is particularly important that these do not increase faster than inflation.

A further key component is the value added by new business, therefore an analysis of profitability by product type will help to identify the contracts that add most value.

The company's future new business plans, together with the profitability by product can be used to give an approximate indication of the rate of growth that might reasonably be expected from this source.