

EXAMINATIONS

September 1997

Subject F — Life Insurance

Paper One

EXAMINERS' REPORT

- 1** The unit administration costs of processing pension and term assurance contracts are unlikely to be the same.

For example, term assurance contracts are subject to underwriting, whereas pension policies are not, unless they include a waiver of premium benefit, or life cover.

It may be more appropriate to express the underwriting costs as a percentage of the sum assured, rather than as an amount per policy.

The number of policies written over the last three months, and hence the unit costs incurred, may not be typical of the longer term position.

Although all aspects of the new business processing are performed by the department in question, it is likely that other related expenses, such as systems development, will be incurred outside the department.

Conversely, the department may be performing other tasks, the cost of which should be excluded from the analysis.

The expenses associated with single and regular premiums policies also differ.

There may have been exceptional one-off costs, e.g. special projects which may need special treatment.

If the review is distorted, this could lead to the premium rates being distorted and result in expense overruns if the total expense margins are insufficient in the future.

Allowance would need to be made for inflation from the date of the investigation to the period over which the premium rate would be used.

To be competitive no allowance may be made for overheads.

- 2** (i) 4% of the gross mathematical reserves.

The mathematical reserves are the reserves determined in respect of the contracts as shown in the DTI Returns and include any resilience test reserves.

Reduced by a factor equal to 1 minus the ratio of the mathematical reserves reinsured to the total mathematical reserves.

Subject to a minimum value of the factor of 0.85

or 0.5 for pure reinsurance companies.

- (ii) The guarantee fund is 1/3 of the required solvency margin.

Subject to a minimum of

800,000 units of account for a proprietary life office
600,000 units of account in the case of a mutual office
and 200,000 units of account for a pure reinsurer.

The Company must cover at least one-half of the guarantee fund subject to a minimum as above with explicit items.

“Explicit” items refer to the excess of assets over liabilities shown on DTI Form 9.

It can cover the balance, if any, with implicit items, i.e. future profits, Zillmer, hidden margins.

- 3** (i) New Business Strain arises when a policy is sold and the first year's premium is insufficient to cover the initial expenses, initial commission and valuation reserves (including any required solvency margin). Normally this will only apply to regular premium policies.

- (ii) - Zillmerise
- seek reinsurance on modified original terms
- adopt a weaker valuation basis
- limit the sales of new business on “capital hungry” contracts
- increase premium rates
- reduce expense
- alter commission terms

- (iii) **Reduced or nil allocation period**

In the early years of the policy a reduced amount of the premium (possibly none) is actually allocated to buy units.

The non-allocated part is used to pay for the initial expenses and commission and possibly contribute to profit.

Reserves are reduced as fewer units are purchased.

Actuarial funding

The whole premium is invested in units.

However for valuation purposes a reduced unit reserve is established by capitalising charges expected to be earned in the future.

Corresponding surrender penalties allow reduced valuation reserves which in turn reduce the new business strain.

- 4 (i) The surrender value scales should be:
- easy to calculate and understand
 - consistent with methods of alterations of policies and making policies paid-up
 - competitive
 - equitable between leavers and stayers
 - recoup initial expenses and allow for risk costs
 - have regard to any applicable asset share calculations
 - consistent with maturity value/sum assured at longer durations
 - meet policyholders reasonable expectations
 - should not change too frequently

- (ii) In acquiring the business the office incurs significant expenses.

Commission is payable to a financial adviser or the sales force.

This can be up to 150% of annual premium, which may be partly clawed back if the policy is terminated early.

Sales and marketing costs are incurred in the promotion of the product.

The office also incurs expenses in setting up the policy on the "books" and performing any underwriting if necessary.

These together are often equivalent to more than 1 year's premiums.

Therefore in calculating surrender value which can be offered the office has to take account of the initial expenses incurred.

Any significant surrender value in the early years is likely to be at a loss to the life office.

The surrender value also has to take into account the cost of life cover when compared with the premiums paid, which may be significant particularly for older lives.

- 5 The Appointed Actuary (AA) must be satisfied that the premium rates are appropriate, i.e. sufficient in due course to enable the company to meet its liabilities, having regard to the level of free assets and other relevant matters.

This has to be certified in the DTI Returns.

If new business terms constitute a drain on the free assets, the AA must consider the capacity of the company to continue writing new business on these terms and inform the Directors accordingly.

These decisions are probability statements and hence the AA must exercise judgement based on sound actuarial techniques and must specifically consider:

- the complex questions of tax relief and allowances for a new company
- the adequacy of the provision for expenses
- the existence of any options, including guaranteed surrender values and consequently the risk of policyholders gaining by lapse and re-entry.

If a contract is likely to cause significant new business strain the AA must be satisfied the necessary reserves can be set up, and, if need be, indicate any limits required on sales volume.

For the purposes of the above the AA cannot assume that the shareholders' assets in a proprietary company are part of the free assets as they can be used for other things.

There are other general conditions which must be borne in mind.

- 6** It may not be possible to invest significantly more in equities because of regulations concerning the maximum valuation rate of interest.

A shift in investments to equities will usually lead to a reduction in the maximum permitted valuation interest rate.

The potential effect of this reduction will be to increase the value of the liabilities thus reducing available free assets and hence constraining investment policy.

Mismatching regulations may also have an impact.

The more the company invests in riskier assets with a higher expected return the higher the required mismatching reserve.

This again increases the value of liabilities, reduces free assets and therefore constrains investment freedom.

These riskier assets by definition mean that the office would run a greater risk of exhausting its free assets and so the other Directors may not agree with this view.

- 7** (i) Occupation — whether the membership is works, non-works or management and the type of industry involved.

Geographical location — environment can influence experience.

Free Cover Limit — the lower the limit the greater the homogeneity of risk.

Past Scheme Experience — a scheme's past experience may be of use if there is sufficient data.

Voluntary or not — anti-selection is reduced if the scheme is compulsory otherwise the take-up rate is important.

Guarantee period — a margin in the basis will be needed to cover any guarantees given.

- (ii) number of lives
average sum assured
degree of discretion in choosing level of cover
whether the scheme is compulsory or not
proportion of eligible members who join
competitors' levels
whether members have to be at work when cover commences
- (iii) The life office is open to anti-selection. It might insist that 75% of those members who are eligible join the scheme.

It might insist that when new lives become eligible they must be actively at work, and that they have a "one off" opportunity to join.

Limit any premium rate guarantee period to a short term.

The life office could introduce a waiting period before claims are admitted.

A declaration of good health may be asked for on joining.

The life office could introduce a profit share arrangement with the employer so as to share the risk.

Introducing a profit share requires a higher premium than a without profit premium and should be sufficient to cover all reasonable risk.

Reduce free cover limit.

If a profit is made this is shared with the employer on an agreed basis.

A typical basis might be $a.(bP-C)$ where

- P profit sharing premium charged
- C actual claims paid under the scheme
- b factor allowing for life office expenses (0.85 to 0.9)
- a proportion of profit to be returned to the employer

The more credible the experience under the scheme the higher a will be.

Exclusion of pre-existing conditions.

Reassurance could be used to limit the risk.

A minimum number of members for the scheme could be set.

Limit options, e.g. continuance options and include appropriate exclusions.

- 8** An analysis would be performed to cover the experience for each year and the period since commencement.

The extent of the analyses will depend on the volume of business written.

Experience may be analysed by sales channel.

Claims experience

Actual claims should be compared with the numbers and amounts expected on the premium basis.

The analysis would include a split by male/female and smoker/non-smoker.

If the experience is large enough medical and non-medical cases may be analysed separately.

AIDS claims would also be monitored.

Lapse experience

Lapse experience should be analysed by comparing actual lapses with numbers expected on the premium basis. If the data is large enough then analyses of lapse rate by duration should be carried out.

This is particularly important for the early years.

Expense analysis

Expected expenses on the premium basis can be projected for each year in the future and compared with the actual expenses. Actual expenses would have to be estimated from an expense allocation exercise.

Initial expenses should be split from renewal expenses for the analysis.

Analysis of surplus

For each year the expected income and outgo would be compared with the estimated actual income and outgo so that the expected surplus/deficit can be compared with the actual surplus/deficit.

Further analysis of surplus would indicate the sources of surplus/deficit.

Options

Analysis may be made of option take-up and conversion rates.

- 9**
- (i) This is a method for placing a value on a life office's policy liabilities that deducts from the value of the future benefits (including discretionary benefits) the value of future office premiums payable. In addition, future expenses are allowed for explicitly.
- (ii) The following inherent features of the method can cause problems:
- Unless the valuation basis is equal to or stronger than the pricing basis, the reserve at the start of a contract will be negative.
 - Depending on the purpose for valuing the liabilities this may be a problem as a negative reserve implies treating a liability as an asset.
 - The problem can be solved either by an appropriate choice of valuation assumptions or by setting any negative reserves in the valuation to zero.
 - The method requires explicit assumptions to be made about future bonuses and future expenses.
 - In addition, if allowance is made in projecting the cash-flows for withdrawal, explicit assumptions will be required for future withdrawals.
 - The resulting reserve will be sensitive to the assumptions made. Care is therefore needed when interpreting the results of a valuation using this method.
 - The method capitalises differences between the valuation assumptions and the pricing assumptions.
 - Depending on the purpose for valuing the liabilities, it may be imprudent to reduce the reserve by the present value of margins in the premiums intended to meet future adverse contingencies or, in the case of with-profit contracts, future bonuses.
 - The problem, where it arises, can be solved by choosing valuation assumptions that allow for the margins in the premiums.

- (iii) The assets would normally be valued using a realistic method.

One approach is to take the market value, using an appropriate surrogate for assets, such as unquoted securities, where the market value is not readily ascertainable.

An alternative approach is to take the discounted income value.

This entails discounting the future proceeds for the assets, at an interest rate consistent with that used to value the liabilities, making an appropriate assumption for future dividend and rental growth.

10 (i) Original terms methods

- quota share
- individual surplus

Risk premium methods

- reducing retention (RRM)
- constant retention (CRM)

- (ii) Quota share. A fixed percentage of the sum assured, specified at outset of each policy is reinsured. The claim is split by this percentage.

Individual surplus. The reinsured amount is the excess of the original sum assured over the company's retention limit on any one life.

Risk premium methods. Assume £ R of £ S original sum assured is reinsured.

	RRM	CRM
Total sum at risk	$S(1 - V_t)$	$S(1 - V_t)$
Reinsured amount	$R(1 - V_t)$	$R - SV_t$ if > 0 , nil otherwise
Sum retained by direct writer	$(S - R)(1 - V_t)$	$S - R$ if $R > SV_t$ $S(1 - V_t)$ otherwise

11 (i) Advantages

The method is simpler.

Contract is straightforward in design.

Long-established company so will have

- reliable experience data
- stable tax position

so the complexities of profit test may be unnecessary.

Disadvantages

The profit cannot be explicitly assessed.

Solvency margin requirements will be high and cannot be allowed for explicitly.

Lapses are an important decrement which need consideration.

Mortality and lapse rates varying with duration cannot be allowed for.

The office is likely to have software written to profit test other contracts, so little extra cost.

Cannot do sensitivity testing.

- (ii) The suggestion has some merit because if sufficient volumes are sold, profits may well cover a share of overhead expenses.

But to do this volumes may be so large as to generate solvency margin requirements beyond the resources of a small mutual.

This will be a problem as the office has no ready sources of additional capital.

Overhead expenses, such as management, computer systems developments, office premises etc. may be already covered in the pricing of the current volume of non-term assurance business.

Thus if additional business is written, even on marginal costs, profits will accrue.

However, in reality that is unlikely. Additional volumes of term assurance may reduce volumes of fully-costed product lines.

If the company has adequate reserves the contract might be fully loaded for expense, but priced with a reduced profit margin.

Can an innovative idea be found enabling the company to sell a fully priced product?

Or will target marketing enable the contract to be sold?

Or a different sales channel?

The proposal is probably untenable as it stands.

(iii) A FIB contract has a reducing value of benefits as expiry approaches.

If a level premium is charged there is a lapse and re-entry option near the end of the policy term.

Or even, for healthy lives, a “lapse and take a risk” option.

If this was widely exercised the office wouldn't receive adequate premium margins for expenses and cover.

Shortening the premium paying term increases the premium and removes the option (because future cover has already been paid for).

The increased premium resulting will also help avoid the cost of the cover in the early years exceeding the premiums paid.

12 (i) For the unit reserve:

- Number of units allocated, subdivided by type of fund.
- Number of units that should have been allocated in accordance with the funding plan, subdivided by type of fund.

For the sterling reserve:

- Some identifier, e.g. policy number.
- Date of entry.
- Date of birth.
- Sex of policyholder.
- Maturity date (life policy) or normal retirement date (pension).
- Premium paying term.
- Premium frequency.
- Current premium.
- Amount of cover, e.g. life cover.

(ii) Principles for the valuation of unit-linked business.

Value liabilities on an individual policy by policy basis.

Value linked assets at market value.

Value non unit liabilities (sterling reserves) separately, if the company is able to continue to purchase units in accordance with the policy plan and cover expenses and commission when due.

Use prudent assumptions which allow for the possibility of adverse deviation from current experience.

Avoid taking credit for future profits.

Ensure that the reserve covers the surrender value for each policy.

Ensure that the total reserve satisfies the “resilience” tests.

Establish a separate reserve for guaranteed maturity values.

Due allowance should be made for other guarantees and options.

Recognise any future losses indicated by the valuation basis.

Cover any mismatching if the unit reserves are not fully covered.

Aggregate reserve could be held for such things as AIDS etc.

- (iii) To determine non unit liabilities, project non unit cash flows for each policy year over each future period.

Use prudent assumptions, determined by reference to experience.

Non unit cashflows will typically be determined as

Premium + Investment income – claims – taxation – expenses
– increase in unit liabilities

This will enable non unit sterling reserves to be established to avoid future strain.

Determine this by discounting cashflows over future years and setting the non unit reserve equal to the largest negative result.

If future non unit surpluses are projected credit may only be taken to the extent that positive sterling reserves exist elsewhere and overall the reserve for any policy is not less than the current SV

For unit liabilities, derive valuation unit prices from market value of assets without any adjustment for buying/selling costs allowing for CGT provision on unrealised gains either through the unit price or an explicit aggregate reserve.

For “resilience” test, carry out cashflow projections consistent with the alternative bases

and use valuation unit prices consistent with the assumed changes in asset values.