

**EXAMINATIONS**

September 1997

**Subject F — Life Insurance**

*Paper Two*

**EXAMINERS' REPORT**

- 1 (i) The embedded value comprises:
- (a) the value of net assets in the shareholders' funds
  - (b) the present value of future transfers to shareholders arising from the in force business

Net assets are normally taken at the value shown in the accounts. They may be reduced to allow for the fact that shareholders need to maintain a balance to ensure solvency (a "locking in adjustment").

Transfers from with-profits business (whether unitised or conventional) are directly related to the cost of bonus.

To calculate the value to shareholders of the with-profits business it is necessary to project future reversionary and terminal bonus.

To do this it is necessary to determine the future balance in payouts between reversionary and terminal bonuses, and their absolute levels.

A variety of assumptions may be used. Typically current rates will be assumed to continue. Alternatively, bonus rates may be determined such that, on a best estimate basis, asset share is paid at maturity.

Having determined an appropriate bonus policy future transfers to and from the estate (including contributions from without-profit business) can be calculated and discounted at the appropriate earned rate.

Free assets in the 90:10 fund may then be added and shareholders' interest in the free estate taken as 10% of this value.

The value of the existing business may then be taken as the sum of this amount and the projected shareholder transfers discounted at the risk discount rate.

To this needs to be added the projected future profits from unit-linked business determined on best estimate assumptions again discounted at the risk discount rate.

The risk discount rate is an interest rate which includes an additional margin above the return on equity investments to build some prudence into the valuation in view of the risks involved and the period for which the profits are locked in.

For with-profits business an alternative to valuing the free estate directly is to increase reversionary and terminal bonus rates on the existing business such that the free estate plus the transfers to and from the estate, discounted at the earned rate, is zero.

On conventional business the valuation rate plays an important part in determining the cost of bonus.

It is important, therefore, to use a valuation interest rate that is sustainable and reasonable in relation to the economic assumptions.

(ii) **Earned rates**

The assumed rate of future investment return will depend upon the mix of the underlying assets and how, if at all, this is expected to change.

A different rate of investment return might be used for different liabilities reflecting different asset matching.

Typical rates of return assumed might be:

Equity	10–12%
Property	10–12%
Fixed Interest	7–9% (less 0.5% for index-linked)
Cash	3–5%

The rate of return may depend on the terms of the liabilities.

Rates of return used will depend upon the method of valuing assets. The principal consideration is consistency.

For life business the rates of return will be netted down for tax at 20%, except for chargeable gains which will be netted at 24% (or less to allow for deferral of realisation).

**Inflation**

Consistency with the investment return is necessary.

Typically in the range 3.5%–5.5%.

**Risk discount rate**

The risk discount rate is driven by the return shareholders want to earn above the risk free rate of return to take account of risks borne.

The risk free rate may be taken as the expected rate of return earned on index-linked gilts.

The margin above the risk free rate will depend upon the availability of capital and returns on alternative investments.

Typically, shareholders will look for a margin above the risk free rate of 2.5% to 5%.

The risk discount rate might be expected to be in the region of 10% to 15%.

Different risk discount rates may be used for different policy types to reflect different risks.

(iii) **Valuation reserves**

Are the valuation reserves calculated using model points (at policy level) equal to the published reserves (calculations should be on the same basis).

**Analysis of change**

Calculate the previous year's embedded value on the same basis as the current year end.

Establish the impact of the change in each element of the basis and assess its reasonableness.

From the restated embedded value project the expected embedded value at the current year end by:

Increasing the net asset value by the expected earned rate;

Unwinding the value of existing business at the shareholders' risk discount rate;

Adding the expected value of new business written during the year on the best estimate assumptions;

Subtracting the expected value of the expense overrun;

Subtracting the expected shareholders' transfer;

Adding the expected investment return to the value of the "free estate" (if the methodology adopted includes such an amount).

Compare the projected embedded value with the calculated embedded value and analyse the effect of differences between actual and expected:

investment returns;  
decrement assumptions;  
shareholder transfers;  
taxation;  
expenses.

Ideally this should be done at product level comparing expected with actual Revenue Accounts.

An alternative method would be to replace the expected basis with the actual experience and quantify the effect of changing each element.

**Data checks**

Control totals of the numbers of policies  
total premiums in force  
total benefits in force

would be checked against other systems

**2** (i) Administration Charges (by deduction from unit fund)

Bid Offer spread

Fund Management Charge

Policy Fee

Surrender Penalties (or lapse with no value)

Unit Allocation Rates

Unit Cancellations (for risk benefits)

Switching charges

- (ii) The maximum sum assured is a function of the charging structure, the profit the life office wishes to make and the need (or otherwise) to be competitive.

The prospective investment return can also be taken into account.  
Stages are as follows:

For a given premium, charging structure and sum assured project, the future cashflows

based on expected experience

for a number of model points

	Unallocated part of any premium paid
+	Fund Management Charge
+	Administration Fee
+	Critical Illness charges
+	Mortality charges
-	Commission
-	Expenses
-	Non Unit Part of any claims
+	Surrender Penalties Received
±	Change in Sterling Reserve

Discount the cashflows at the shareholders risk discount rate and compare with the profit target.

If the profit target is not met change the charging structure e.g. increase the nil allocation period, increase the premium or reduce the sum assured, or a combination of all, until the profit criteria are met. Carry out sensitivity tests and repeat if results are unacceptable.

One would then consider different growth rates and mortality experience for various sums assured and decide on the maximum sum assured such that the likelihood of a premium increase at year 10 is within acceptable limits.

Compare with competitors' rates per mille of sum assured. If rates are uncompetitive consider reducing the premium rate.

If the premium rate is reduced then recalculate profitability and carry out further sensitivity work on the new rates.

(iii) **Investment risk**

With a front end load contract on a maximum sum assured basis very little underlying unit fund is built up.

Profit from the annual management charge is therefore negligible and the risks are therefore small.

To remove the risk to the office investment return could be ignored, as negative units could be used.

**Withdrawal risk**

The office will be most at risk in the early years when it has incurred large initial expenses (commission, administration etc.)

Nil allocation periods recoup costs quickly so the risk is reduced.

For competitive reasons the nil allocation period is often not long enough.

Penalties as a % of fund or premium may therefore be used on surrender or PUP.

Depending upon the allocation structure the fund might be zero in which case penalties are worthless.

Could try to extend commission clawback periods. Unlikely if distributed by IFAs. Possible if own salesforce.

Risk for selective withdrawals after 10 years if premiums need to be increased.

**Mortality/morbidity**

New contract so no claims experience.

Depending upon the amount of capital available and aversion to risk would seek reinsurance.

Could reinsure on a quota share risk premium basis.  
Alternatively reinsure above a retention level.

Restrict critical illness claims to certain diseases about which there is sufficient information to price.

Exclude pre-existing conditions.

Acquire underwriting expertise.

Ensure sufficient allowance is made for trends in incidence rates and changes in medical practice and medical advances.

Ensure critical illness definitions are clear about what is covered and do not leave the office open to unknown or unanticipated claims.

Ensure there is correspondence between CI definitions, the pricing and claims management.

### **Premium rate guarantee**

Premium rates are guaranteed for 10 years.

If morbidity etc. worsens there is nothing that can be done although deductions could be increased to the extent there is a unit fund.

Therefore build a margin into the rate by aiming for a target fund after 10 years of, say, 20% of premiums paid. Effectively increase the premium per mille of sum assured to fund the guarantee.

This may not be possible for competitive reasons.

Suitable reinsurance to limit the exposure to the guarantees or from experience worse than a specified level.

### **Expenses**

Nothing much can be done apart from control expenses.

Can also give the right to increase administration fees and annual management fee within the policy document.

Need to be aware of the Unfair Contract Terms and PRE so complete freedom is not allowed.

Also need to bear in mind that increasing expenses will infringe upon the guarantee margin.

Risk in pricing as no previous experience so nothing to base costs on. Assume same as on existing whole life policies.

### **Taxation**

Taxation suffered by the holders of life policies and life insurance companies in the future is uncertain.

It is difficult to do much about this risk although if the company has the ability to reflect changes in its charging structure it would help.

### **Mix of new business**

In pricing, an average policy size will have been assumed when setting expense loadings. If the actual size is different losses may result.

This risk can be reduced by charging each policy its actual per policy expenses, but competition may limit the ability to do this.

The mix of business between levels of cover may be important.

### **Volume of new business**

A certain volume of business will have been assumed in the new business plans:

- (a) to ensure that volumes are within resources available
- (b) to ensure that expenses are covered in aggregate

There is thus a risk of too much business and too little. It is difficult to do much about this except to monitor it and review plans.

## **3 (i) Investment income and bonus-loading surplus**

The reversionary bonus system will cope reasonably well with these items of surplus especially if the bonus loading is suitably calculated and either a bonus reserve valuation method is used or a net premium method with a suitably reduced interest rate.

### **Expense surplus**

For most contracts this surplus is large and negative in the first year and thereafter smaller and positive — although it may become negative as expenses inflate.

A Zillmer adjustment will ease the distortion of surplus but expense surplus is not really suited to a reversionary bonus system.

### **Mortality surplus**

This source of surplus will usually be small and for most with-profits endowments it will reduce over the term. It is thus not suited to a reversionary bonus system.

### **Withdrawal surplus**

The extent and pattern of emergence depends upon the surrender value basis used. It is not usually suited to a reversionary bonus system.

### **Valuation strains**

These will arise through the use of a lower interest rate for reserving purposes than for pricing purposes for contracts such as immediate annuities and may also arise under the unit-linked contracts.

The strain would be recouped over the lifetime of the business.

This causes problems for the reversionary bonus system.

A possible solution is to take the total surplus for distribution from unit-linked and without-profit contracts as the increase over the year in the present value of future profits on this business, calculated on prudent assumptions.

Terminal bonus can be used to distribute any outstanding surplus from the above sources at maturity in excess of that distributed by means of a reversionary bonus.

It is also particularly appropriate for the following:

### **Mismatching surplus**

This arises primarily on without-profit non-linked contracts where the company has decided not to adopt a matching investment policy. The greater the extent of the mismatching the greater will be the volatility of this source of surplus.

### **Capital appreciation**

This is likely to be large and volatile. As it will not have been realised (realised gains are normally included in investment income) it is not appropriate to distribute as reversionary bonuses.

However, if a Fund is heavily invested in equities a portion (the part of the gain which is deemed to be permanent) may be needed to support the reversionary bonus rate.

The bulk of this surplus will be distributed as terminal bonus.

(ii) **The company**

Significant new business strain is a common feature of conventional with-profits contracts.

It is more easily avoided by adopting the unit-linked approach of specific initial charges, e.g. front-end loading or indirect charges via capital units and surrender penalties, to make the contracts less capital hungry.

The reversionary bonus method for a conventional contract tends to generate a higher cost of bonus in the early years than a unitised with-profits (UWP) approach.

On a UWP product bonuses are declared as a percentage of accrued benefits and so there is a greater deferral of surplus distribution.

Rider benefits such as critical illness cover can be easily incorporated in a UWP contract whereby charges for the benefits are taken by deduction from units.

This flexibility helps avoid having to offer guaranteed premium rates for the benefits and allows the charges to be reviewed and changes implemented more easily.

Whilst conventional contracts tend to have a built-in guaranteed rate of return on investments in the premium rates, UWP contracts seem to be acceptable with lower guarantees in the rate of return.

This is evidenced by a move to a zero guaranteed return by offices recently under their UWP contracts.

In moving to a design which is more akin to unit-linked the office will be able to administer the business using a unitised approach as it also transacts unit-linked business.

For pension contracts in particular, a mixture of unit-linked and unitised with-profits investment can be offered.

Compared with conventional contracts there may be less of a policyholder expectation that current bonus levels will be maintained, provided the marketing material is worded accordingly.

This, together with the greater deferral of surplus inherent in the bonus declaration, allows the office greater investment freedom which may result in greater returns for the policyholder.

The product is more readily understood as charges are more explicit and bonuses are related to the value of units.

Possible disadvantages are:

- more expensive to administer
- may need new systems

### **The policyholders**

For conventional contracts with reversionary bonuses the policyholders have an expectation that the company will maintain its rates of bonus provided investment conditions do not change significantly, so that prediction of maturity proceeds is easier.

This is less of an expectation for UWP contracts.

UWP contracts are easier to understand than conventional contracts.

There is likely to be a switching option available between UWP and unit-linked funds.

UWP contracts have a higher potential ultimate return as there is a greater deferral of distribution of surplus.

(iii) The following investigations would be needed:

- A gross premium valuation or discounted cash flow would be used to solve for the bonus on a realistic assessment of future experience.
- A projection forward of the assets and liabilities on various different future experience scenarios, incorporating bonuses that are consistent with the projected experience.
- An assessment of the bonus rates available for similar contracts in the market would be made but competitive rates should only be adopted if internal investigations justified it.
- As the UWP contracts will be in a separate fund a different bonus philosophy could be adopted than for conventional business.

This might allow a higher initial bonus rate to be offered provided PRE were that more volatile bonuses and possible lower terminal bonuses might be the result.

- 4 (i) There is no explicit reserve for future expenses.

For regular premium contracts there is an implicit allowance in the difference between the office premium actually received each year and the net premium assumed to be received.

If this implicit allowance is considered to be inadequate, it can be increased by limiting the net premium to an appropriate percentage of the office premium or by holding an explicit reserve.

For contracts where no future premiums are payable, the method makes no allowance for future expenses.

An explicit reserve would need to be held or, alternatively, implicit allowance could be made by reducing the valuation interest rate.

It assumes that the actual incidence of the expenses is level over the lifetime of the contract whereas, in practice, the initial expenses will be significantly higher than the renewal expense.

A Zillmer adjustment can be made to the net premium in order to take this uneven incidence of expenses into account.

This adjustment is an addition to the net premium and takes the form of an amount representing the initial expenses to be amortised divided by an annuity factor for the premium paying term of the contract calculated on the same interest and mortality assumption used to calculate the present values.

There is no explicit reserve for future bonuses under with-profits contracts.

The method assumes that the difference between the office and net premium will be adequate to provide for future bonuses, in addition to meeting future expenses.

Where cash bonuses are being declared the above implicit allowance is likely to be appropriate.

If reversionary bonuses are being declared, the implicit allowance is unlikely to emerge in a suitable form to provide a level bonus over the whole term of the contract.

The net premium method can be adjusted so as to make the allowance more appropriate by reducing the valuation interest rate by a proportion of the expected rate of future bonus.

If a terminal bonus is being given, there is no provision at all in a net premium reserve.

It is in any case controversial, in the UK, whether a reserve should be made for a terminal bonus.

There is an implicit reserve in the excess of the market value of the assets over their adjusted book value as shown in the DTI returns.

This could be made explicit by adding a specific reserve for terminal bonus to the net premium value of the liabilities.

Net premium reserves are relatively insensitive to a change in the future interest assumption.

Thus if a net premium value of the liabilities is being compared with a market value of the assets, as it is for the purpose of demonstrating solvency in the UK, the two values will not move in line on any change in investment conditions.

This problem can be reduced by holding a resilience test reserve.

For some contracts a net premium valuation is not appropriate, e.g. Group Life.

- (ii) (a) The net premium valuation method would be used to produce policy liabilities as the prospective value of future benefits less the value of future premiums.

The future benefits are the sum assured and bonuses payable at maturity or an earlier death.

The future premiums valued are the theoretical net premiums allowing only for the interest and mortality.

Expenses are only allowed for implicitly.

An appropriate basis would be:

#### **Mortality**

90% to 100% of AM80 ult or AF80 ult, as appropriate, AIDS will be allowed for using 33% to 75% of R6A.

#### **Interest**

Based on the interest rate used in the premium basis and on the current income yield on the assets.

This would be reduced to allow surplus to emerge in a suitable manner and be subject to the maximum set by Insurance Companies Regulations 1994.

#### **Tax**

20% to 25% depending on the mix of assets.

### **Zillmer**

Subject to the maximum permitted by the Insurance Companies Regulations.

Typically 2% to 3½% of the basic sum assured.

### **General**

Any negative reserves should be eliminated.

The difference between the net and office premium should be checked to ensure it is sufficient to meet future expenses.

If not, the net premium may have to be limited to a maximum percentage of the office premium, (say 95%) or an additional expense reserve held.

- (b) The liability under the contract is defined partly in terms of units and partly in terms of money. Matching considerations require that the method used to value the liabilities must separate out these two parts. A gross premium cash flow approach would be used, to calculate non-unit reserves. Non-unit reserves would be set on a policy by policy basis to ensure that future cashflows are covered.

The sum of the unit reserve and non-unit reserve must be non-negative and must be at least as great as the current surrender value.

Subject to these constraints negative non-unit reserves would be permissible. However, combined non-unit reserves over all policies should be positive.

Unit liabilities should be matched by corresponding assets or a mismatching reserve would be required in addition to the unit reserve.

The bases used in the valuation would be as follows:

### **Mortality/morbidity**

Inception and annuity values based on the following percentages of CMIR 12.

Claim Inception	120%–150%	say 140%
Recovery year 1	60%–80%	say 70%
Recovery year 2	80%–100%	say 90%
Mortality of life	100%	AM80/AF80
(a lower rate than this would be more prudent)		

No allowance would be made for AIDS if the policies had an AIDS exclusion clause. Otherwise some allowance would need to be made.

Mortality of healthy

75–90%	of AM80	for males, say 80%
75–90%	of AF80	for females, say 80%

Interest

Unit funds grow at 6%–9% (say at 8%) before tax and management charges/investment expenses (low is conservative).  
Gross investment return on positive non-unit reserve 4%–7% (say 6%) (low is conservative).

Gross investment return on negative non-unit reserves 10% say (high is conservative).

For claims in payment a rate of 4% would be used to allow for inflation of payments.

Expenses

£2–£5 per month		say £2.50
Claim inception expense	£100–£150	say £125
Investment expenses	0.2–0.5% p.a.	say 0.3% p.a.
Ongoing claim expense	£15–£25 per month	say £20

Commission

Renewal commission as paid, most likely 2.5% of premium.

All monetary expenses assumed to inflate at 5% p.a., consistent with interest assumption used.

Charges

As specified in product literature. Charges subject to inflation assumed to inflate at a rate consistent with expense inflation.

Rates of voluntary discontinuance

Non where they reduce the liability. Otherwise, say 10% p.a. in year 1, 5% p.a. thereafter (lower than experience to provide a margin).

Reinsurance

As per any treaty in force.