

# **EXAMINERS' REPORT**

*June 2018 examinations*

## **Subject F102 — *Life Insurance* Fellowship Principles**

### **INTRODUCTION**

The attached report has been prepared by the subject's Principle Examiner. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions.

## QUESTION 1

### i. Reasons:

- Retaining the policy gives the company the opportunity to:
  - Have the policy make some contribution to overheads.
  - Possibly make some profit on the smaller policy.
- Retains the formal relationship with the policyholder for possible future opportunities.

### ii. Considerations:

- Terms after the alteration should be supportable by the earned asset share.
- The terms should avoid selection against the company, viz.:
  - Alterations should avoid lapse and re-entry.
  - Increases in benefits may require underwriting.
- The future profits earned from the altered policy should be fair.
- The terms offered should be fair to both policyholders that are altering their policies and those that are not.
- Ensure consistency with boundary conditions.
  - E.g. The premium after reducing the sum assured should be consistent with paid-up values (where the future premium is zero).
- Increases in benefits should be consistent with taking out a new policy.
- The surrender value before the alteration should be similar to the surrender value after alteration.
- Policyholders' reasonable expectations may play a role, for example:
  - The terms offered at early duration should look reasonable compared to premiums paid to date.
  - The benefits offered close to maturity should look reasonable compared to the original maturity benefit, given the type of alteration (e.g. future premiums may not be payable)
- The alteration should be stable, i.e. small changes in benefits should lead to small changes in premiums.
- The alteration basis should not change too often, unless financial conditions require a change.
- Costs relating to the alteration should be covered.
- Consider the ease of explanation to the policyholder, ease of administration and documentation.
- Alteration terms offered by competitors should be considered
- The potential requirements imposed by regulation / professional guidance should be considered.

### iii. Alternatives:

- Reduce the sum assured. This will reduce the premium, which may relieve some of the financial pressure for the policyholder.

- Allow a change of the endowment assurance product to a term assurance product. Removing the savings component will lead to a lower price.
- Allow a change of the whole life product to a term assurance product. Limiting the term will remove the effect of higher mortality at higher ages and payment of the benefit will no longer be certain, reducing the premium.
- Allow an increase in term on the endowment assurance product. The benefit will, on average, be paid later, which will lead to a reduction in the premium.

iv. Other elements that may be impacted:

- Lower investment returns.
  - Could affect maturity.
    - This could lead to policyholder dissatisfaction and marketing risk.
  - Could reduce solvency as free assets reduce.
    - The situation would be worse if the company is not matched.
    - This may require a change in investment strategy
  - For unit-linked business profits could reduce, as much income will be linked to the value of the units.
  - For with-profits business the company will have to declare minimum bonus levels, but may not have sufficient returns (particularly if return is negative).
  - May cause guarantees to bite, and will need to reserve accordingly.
- The increased uncertainty may increase the cost of capital required by shareholders, which:
  - May have a negative impact on premiums.
  - May make it difficult to raise capital if needed.
- New business could reduce due to a reduced disposable income of consumers.
  - This in turn may have a negative effect on the unit costs of policies as the in force book declines.
  - There may be an increase in competitive pressures as the demand for products decreases.
- Expenses could be higher due to higher inflation.
  - The company may have to consider retrenchments to manage costs, which will negatively affect employee morale.
- Fraud may rise, from both staff and policyholders.
- E.g. disability income claims often increase during an economic downturn.

*On average candidates performed well on part (i).*

*Part (ii) was a bookwork question and candidates that were well prepared did well.*

*Part (iii) was poorly answered, with answers typically only including one or two suggestions.*

*Candidates that did well on part (iv) typically provided a wide range of points, with credit being awarded to several points not on the marking schedule.*

## QUESTION 2

- i. A retention limit is the maximum amount of risk retained by the cedant on any individual risk. Beyond the retention limit, the insurer cedes the excess risk to a reinsurer.

The general factors to take into account when setting the retention limit include:

- The average benefit level for the product.
  - The expected distribution of the benefit amounts.
  - The company's insurance risk appetite.
  - The level of the company's free assets and the importance attached to stability of its free asset ratio.
  - The terms on which reinsurance can be obtained and the dependence of such terms on the retention limit.
  - The level of familiarity of the company with underwriting the type of business involved.
  - The effect on the company's regulatory capital requirements of increasing or reducing the retention limit.
  - The existence of a profit-sharing arrangement in the reinsurance treaty.
  - The company's retention limits on its other products.
  - The nature of any future increases in sums assured.
- ii. Set the retention limit at such a level as to keep the probability of insolvency (or ruin probability) below a specified level. An alternative approach is to aim for a probability that the loss in any one quarter or year does not exceed a proportion of the earnings of the business, if that is how the cedant determines its risk appetite.

This can be done by using a stochastic model for projecting claim rates and a model of the business, so that claims can be projected forward together with the value of the company's assets and liabilities. By using simulation, a retention level can then be determined such that the company stays solvent, or earnings stay above a certain level, for 995, say, out of 1000 runs.

Summarising the procedure for determining suitable retention limits:

1. Decide on some criterion for claims volatility beyond which the company cannot go. For example, you might want to have only a 1% chance that the net loss from claims is at least R25m.
2. For differing retention limits, having sounded out reinsurers on terms available for your business, model the function “{total claims net of reinsurance} less {total risk premiums net of reinsured risk premiums}”. This modelling will be done stochastically, varying the mortality experience.
3. The function is therefore:

$$X = [C(g) - C(r)] - [P(g) - P(r)]$$

where:  $C(g)$  = gross claims

$C(r)$  = claims recovered from reinsurer  
 $P(g)$  = risk premium available (from policy) to insurer  
 $P(r)$  = risk premium paid to reinsurer

The criterion would therefore be that  $\Pr(X > 25m) = 0.01$  .

4. Look at the results of this modelling to choose the retention limit that will satisfy your criterion.
- iii. To obtain the optimal balance between reinsurance and a mortality fluctuation reserve we might assume that some of the cost of the risk premium reinsurance is instead going to be spent on financing a mortality fluctuation reserve.

The cost of holding a reserve of size  $M$  is equal to:

$$M(j - i)$$

where  $j$  is the expected rate of return from the company's capital, and  $i$  is the expected rate of return from the assets that will back the reserve.

This follows from the fact that, by tying up capital in a mortality fluctuation reserve, the company is unable to use that capital to finance other ventures, from which it would have expected to earn a return of  $j$ . Instead, it will earn an expected return of  $i$ , hence the difference is the cost (i.e. loss of expected return) to the company over one year.

If we decide to redirect, say,  $x\%$  of the reinsurance risk premium to the mortality fluctuations reserve, then the amount of mortality reserve purchased (for one year) is:

$$M = (x/100) P(r) / (j - i)$$

We now have only  $(1 - x/100)P(r)$  left with which to buy reinsurance, so we will have to have a higher retention level in order for the cost to be only  $(1 - x/100)P(r)$ .

Hence we have been able to exchange reinsurance for a mortality fluctuation reserve, at parity of cost.

We can now model the distribution of  $X$  under this new arrangement, noting that we now have a higher retention level (so the claims recoveries from the reinsurer will be lower) and  $X$  is now calculated as:

$$\begin{aligned}
 X &= [C(g) - C(r)] - [P(g) - P(r)] - M \\
 &= [C(g) - C(r)] - P(g) + 29P(r)
 \end{aligned}$$

where  $C(r)$  is the claims recovered from the reinsurer at the new level of retention.

Compare the protection offered under this new construction against that offered by the previous arrangement, i.e. recalculate  $\Pr(X > 25m)$  .

If this probability is less than the 1% previously obtained, then using a mortality fluctuation reserve (to the extent assumed) is cheaper than using reinsurance, and would therefore be the preferred strategy.

We can then try this for other levels of reinsurance and mortality fluctuation reserve. Then we can decide on which combination offers the most protection for a given cost.

If the degree of protection is increased by the use of a mortality fluctuation reserve, then we can determine (probably by trial and error) the actual amounts of mortality fluctuation reserve and retention level that are necessary to meet our desired ruin criterion, with lowest cost to the insurer.

*Part (i) was bookwork and was generally well answered by prepared candidates.*

*Part (ii) was reasonably well answered by the better prepared candidates. However, some candidates provided too much detail for 4 marks and wasted time giving detail on points that were not necessary. A number of candidates focussed on model points and outlined general asset-liability modelling, which was not appropriate for the question.*

*Part (iii) was poorly answered by most candidates. The majority of candidates did not appear to know what a mortality fluctuation reserve is, and many thought that one simply replaces reinsurance with a mortality fluctuation reserve and did not attempt to explain how to combine such a reserve with reinsurance to obtain the optimal balance.*

### QUESTION 3

i. Market-consistent value:

- First project the net liability cash outgo that would be expected in each future year from the existing portfolio of policies. In this case, the cashflows will include annuity payments and expenses.
- Assuming the cashflows are certain and guaranteed amounts, the market-consistent value is then found by discounting the cashflows at current risk-free rates of interest.
- The risk-free rate of interest to discount a guaranteed cashflow due in  $t$  years' time would be the current market redemption yield on a secure (probably government-backed) zero-coupon bond of the same term. Index-linked bond returns should be used for index-linked annuities.
- A deduction for credit risk might be required if there is a risk that the developing country's government could default on its debt.
- Alternatively, determine the portfolio of such zero-coupon bonds that could be owned at the present time that would produce exactly the same future cashflows as the liabilities. (This is referred to as the "replicating portfolio" of assets.)
- The current market value of this portfolio is then the required market-consistent valuation.  
*(The two approaches are identical.)*
- The market values of the replicating portfolio of assets (or equivalently the risk-free interest rates) may need adjustment for any short-term anomalies in the market at the present time.
- In reality, the liability cashflows are not certain amounts, but are instead subject to uncertainty.

- In this example, uncertainty is due to mortality, inflation, and any other factor that could affect the real level of future expenses (including future volumes of in-force policies).
- If we projected cashflows using best-estimate assumptions for these variables, the value we would obtain for the liabilities using the above approach would be lower than market value.
- This is because a purchaser of the liability would require additional compensation, for the possibility that the liability should turn out to be more expensive than expected.
- To allow for this uncertainty, we would need to include “appropriate” margins in the expense, inflation and mortality assumptions, compared with best estimate.
- Some market-based indicators for some of these parameters might be available, and would help determine the suitable level of margin to use.
- For example:
  - The difference between the current market yields of equivalent fixed-interest and index-linked bonds gives an indication of the market’s expectation for future inflation.
  - There might be firms who provide third-party administration services for life insurers, whose fees for taking on the admin for the portfolio would be the market value of the expenses.
- As a liquid market for mortality risk does not exist, a risk margin may be added to the best estimate assumption to reflect the compensation required by the market for taking on the uncertainty.
- Alternatively, an overall risk margin could be added to liabilities calculated on best-estimate assumptions, based on a cost of capital approach.

ii. Advantages:

- This will allow the insurer to value the liabilities using a higher discount rate assumption; thus reducing the value of the liabilities.
- The illiquidity premium is market sensitive, i.e. this is expected to increase during periods where there is general high illiquidity.
- This will enable the insurance company to manage its balance sheet position better (by reducing the asset-liability mismatch) during periods of stressed liquidity in the market.
- This may be in line with the methodology followed by other annuity providers.

Disadvantages:

- Additional volatility in the illiquidity premium assumption may result in more volatile liabilities (which will increase earnings volatility).
- It might be difficult to get approval from the regulator, with little chance of success, and onerous conditions might be imposed on the insurer.
- Higher capital requirements will offset some of the benefit of lower liabilities.

Difficulties:

- The market for infrastructure bonds in the emerging market is likely to be very small, illiquid and not transparent.
- This makes it difficult to accurately estimate the market consistent assumption for the illiquidity premium.
- Theoretical models need to be constructed to determine this assumption, which may be complex and difficult to calibrate due to limited market data.

iii. Restrictions:

- The liquidity premium is only one component of the total spread between the yield of an asset and the liquid risk-free rate. As such, the insurance company should ensure that the spread is fully broken down into the different components (i.e. credit risk) and only the illiquidity credit should be used for the reserving adjustment.
- Restriction on the size of the illiquidity premium by duration i.e. lower over shorter durations and higher over longer durations.
- Restriction on the size of the illiquidity premium by credit rating of the underlying backing assets i.e. lower for poorly rated assets.
- The size of the illiquidity premium should be supported by historical data/experience that has been carried out by company.
- The insurance company may be required to carry out sensitivity testing on the illiquidity premium assumption and disclose the results to the regulator.
- The capital requirement for interest rate risk charge may increase if the illiquidity premium has been allowed for in the liability calculation.
- The illiquidity premium used for the liability calculation should be consistent with the assumption used in determining the premium.
- The illiquidity premium should be reconsidered and updated regularly.
- The illiquidity premium may only be taken into account where the backing assets match the nature, term, currency and amounts of the projected liability cashflows, and where liability cashflows are fairly predictable.
- The use of the illiquidity premium may only be permitted in times of general illiquidity in the corporate bond market; i.e. the illiquidity premium should only be permitted where a similar premium can be identified on the asset side.
- The insurance company should have in place risk management systems and investment policy provisions specifically oriented to the risks inherent to the application of an illiquidity premium, including liquidity risks.
- Requirement that bonds are held to maturity.

*Overall this question was not answered well, with few candidates making use of important information in the question, namely that this is about a “small insurance company in a developing market”.*

*In part (i) many candidates gave the bookwork point of using the corporate yield and swap yield curve (adjusted for credit default) to derive risk free interest rates, without stating that these are probably unavailable (or unreliable) for a developing country. Candidates that mentioned the use of an illiquidity premium did so without mentioning that this insurer (being*

*small) will have unpredictable cashflows and will not be able to make use of an illiquidity premium, assuming that these premiums can even be calculated in a developing country. The premium basis is unlikely to be useful in calculating market-consistent liabilities, and a number of candidates mentioned that the value of future premiums should be included in calculating the liabilities.*

*In part (ii) many candidates did not comment on the proposal as asked, but instead commented on the investment merits of infrastructure bonds, and some even thought that such assets might not be easily available to the insurer, despite the question stating that these assets are backing the liabilities (and therefore they have already been acquired).*

*In part (iii) answers were generally very brief, reflecting a lack of deep thinking and application of bookwork knowledge.*

## **QUESTION 4**

### **i. Advantages:**

- The product is very simple to understand and explain.
- This simplicity means that it should be able to be sold fairly easily through a call centre.
- It covers the benefit that accounts for a significant proportion of all critical illness claims, particularly for females.
- It will be cheaper than the comprehensive product, all other things being equal, and thus attractive to customers in terms of affordability.
- It should be simple to underwrite as there is less scope for anti-selection (with the insurer initiating the sale).
- You will have some data to base the pricing on.
- Cancer is a well-known and documented illness that is perceived to be risky to the public.
- If the product is innovative it might help improve sales, or the company's reputation.
- It should be (slightly) simpler to do the claims assessment.

### **Disadvantages:**

- People may misunderstand the product, thinking it covers more than just cancer, leading to reputational issues.
- It may damage the sales of your existing product.
- If you do not already have a call centre, it will take significant time, and money, to get this going.
- You will need to amend your claims and underwriting processes.
- The new product may result in a lapse and re-entry issue.

ii. Assumption setting:

- The key assumption is the cancer incidence rate
  - Data from your existing product will assist in setting the assumption.
  - You will need to adjust the experience rate to allow for the different underwriting process, which will probably be less rigorous, so assume a higher incidence rate.
  - Adjust for the fact that there may be some anti-selection, that is, people who are worried about getting cancer will be more likely to choose this product.
- The expense assumption is key, and although a portion of this can be estimated from your existing product, you will need to allow for the specific costs of setting up and running the call centre.
  - You should also consider that some of the expenses may be lower, e.g. less senior underwriting and claims resources needed
  - Some expenses may be higher, e.g. significant costs needed to market this product.
- The lapse assumption is crucial and it is likely to be significantly different from your existing product, as the distribution channel is so different.
- Your investment and risk discount rates will be broadly similar to what you use for the existing product, perhaps with a slightly higher risk discount rate to allow for the uncertainty.
- The profit margin could be similar to that for the current product, but may be slightly higher due to this being a new product and hence more risky.
- You will probably need to involve reinsurers which have experience in this market.

iii. Risk mitigation:

- Limit the maximum sum insured that you offer.
- Offer a term product, rather than whole of life, or a shorter term than for the comprehensive product.
- Do not guarantee the premium rates.
- Reinsure a significant portion of the new product, until you have credible experience.
- Add an extra profit margin
  - However, the product will still need to be competitive.
- Limit the number of policies you sell. This can only be crudely managed by adjusting marketing spend.
- Ensure that you have a very quick feedback loop on the claims experience.
- Ensure you have the ability to monitor the experience by the relevant factors, e.g. call centre location, or agent.
- Use longer waiting periods to reduce anti-selection.
- Increase claims underwriting to eliminate invalid claims.

*This was not a difficult question, and performance should have been better than it was. Few candidates performed well on all three parts.*

*The answers to part (ii) were often too generic, with candidates not giving sufficient attention to the particular product.*

*Part (iii) was generally poorly answered. Many candidates did not even get some of the more obvious points. Many candidates overlooked the complications of selling through a call centre. For example, “stricter underwriting” is not a feasible option.*

*Several candidates appeared not to understand the basic constructs of critical illness insurance, as they mentioned mortality and recovery rates and the cost of medical treatment. This is a very poor mistake for candidates at this level.*

## **QUESTION 5**

i. Determining the per policy expenses:

Allocation of costs to unit-linked business:

- Commission would usually not be included in the expense investigation as it is proportionate to the premiums received.
- Marketing costs can be allocated directly to the unit-linked product.
- Staff costs:
  - For the salaries in the relevant departments the insurer will perform a review of the time spent by the relevant departments on the tasks:
  - Inception of new policies, partial surrenders, surrenders, death claims, maturity claims, fund switches.
  - Time sheets may be required showing time spent on each activity for the unit-linked product.
- The once-off cost of the new administration system will need to be allocated to the unit-linked product.
  - This could be amortised over time based on the expected useful lifetime of the system.
- Other once-off costs will be dealt with using a similar approach.
- Indirect costs, e.g. property costs, may be allocated using the floor space used by each department and then allocated in accordance with salaries.
- Overheads, e.g. compliance, will need to be separately identified.
- Rules for allocating overhead costs will need to be determined.
- Investment expenses (investment department, commission etc.) for the internal funds will be allocated to each fund.

Allocating expenses per policy:

- To determine per policy expenses the insurer will need to consider:
  - expenses relating to new business relative to the number of new policies;
  - on-going expenses relative to the number of policies in force; and
  - termination expenses relative to the number of terminations.
- Separate analyses may be performed for different premium bands.

- ii. Appropriate model points for existing business and expected new business will need to be selected for the model.

For each model point project the unit fund using expected investment returns on the unit-fund.

Allow for tax.

Take the investment mix of the investment funds and proportion of policies for each investment fund into account.

Take cashflows for the unit-fund into account (premiums, payments for partial withdrawals, surrenders, deaths and maturity).

Project the cashflows for the non-unit fund (charges and expenses).

Allow for any reserving solvency requirements on the non-unit fund.

Monthly cashflow projections should be used for accuracy of the results.

Assumptions for partial withdrawals, surrenders and deaths will be set on a best-estimate basis.

Investment returns may be modelled stochastically.

Other cashflows are likely to be modelled deterministically.

Allow for any relationships between parameters, for example the relationship between investment returns and expense inflation should be consistent.

Discount the charges less expenses and increase in reserves for each time period.

Use an appropriate risk discount rate that reflects the return required by the insurer and the level of risk related to the net cashflows.

Charges will be set so that the insurer achieves its profit target.

Take the variability of the outcomes of investment returns and sensitivity of the results to individual assumptions into account.

The net cashflow from each model point will be scaled up to reflect business volumes.

A large number of simulations will be required to get a distribution of outcomes for the stochastic model of investment returns.

The insurer may select the mean outcome of investment returns or possibly a point on the distribution allowing for some prudence in the projected unit fund values.

The insurer may investigate the effect of different parameter values to determine the sensitivity of the adequacy of the charges to these parameter values (e.g. withdrawals), and to changes in assumptions of business volumes and business mix.

iii. The insurer will need to consider:

- The extent to which such increases meet policyholder reasonable expectations.
- Whether such increases would lead to an increase in surrenders.
- Charges in the rest of the market.
- The potential impact on new business volumes, particularly if higher than those on competitors' products.
- The extent to which such reviewability of charges was made known to policyholders at the point of sale.
- The impact on the insurer's reputation.

*In general, performance was very poor for this question. Candidates failed to apply their knowledge to the specifics asked within the question. While the majority of candidates appeared to know the relevant theory, many did not read the question carefully and answer what was asked.*

*In part (i) many candidates provided generic answers, and failed to include the specifics of the given product and situation such as the new administration system. Furthermore, only a few candidates actually finished describing how to go about calculating per policy expenses, namely dividing either by expected business volumes, in force policies or terminating policies (depending on timing of expenses).*

*In part (ii) performance was slightly better than on part (i). However, few candidates mentioned tax or non-unit reserving requirements and most failed to distinguish between the unit and non-unit funds in the modelling process. Many candidates, however, did recognize the need for a stochastic model of investment returns and the need for dynamic linking and consistency of variables.*

*Performance on part (iii) was slightly better. Surprisingly few candidates mentioned lapses and new business volumes, or reputational impacts and communication with policyholders.*

## **QUESTION 6**

i. Examples of regulations:

- Maximum limit applied to asset classes (including derivatives), currencies, domicile.
- Maximum limit applied to individual assets/investments.
- Maximum limits applied to assets/asset classes for purposes of demonstrating solvency.
- Minimum prescribed holding in specific assets, asset classes, currencies, domicile.
- Maximum limit applied to counterparties (to limit credit risk).
- Maximum duration on bond portfolios.
- Minimum credit rating .
- Limits on mismatching/matching requirement (e.g. by term, nature, currency), or

- The requirement to hold a mismatching reserve.
- Liquidity requirements.
- Restrict the use of derivatives (e.g. only for matching purposes).
- Prescribed methodology for calculating asset values (fair value).
- Require independent custodian.

ii. Investments for the annuities:

- Nature of the benefits: the instalments are guaranteed in terms of the CPI index.
- Nature of future expenses: these are likely to be real and likely to be between CPI and salary inflation, however this depends on the company's efficiency and cost control.
- Term of benefits and expenses: this depends on the types of annuity and annuitant profile, however for life annuities the average outstanding term could be many years.
- Currency: likely to be local currency for both benefits and expenses.
- Liabilities could be uncertain due to:
  - Mortality/longevity fluctuations (although for a large annuity portfolio, mortality fluctuations should be relatively small and benefit outgo quite predictable).
- Suitable assets should include those whose returns are guaranteed or expected to increase in line with CPI:
  - CPI linked government bonds provide a 'risk-free' return to the insurer; however these might not be available in a developing country (or in sufficient quantity or of desirable terms), and the CPI guaranteed return is only available if held to maturity.
  - It is unlikely that corporate CPI-linked bonds would exist, however if they did the insurer could consider these – the additional return over risk-free might be more than sufficient compensation for credit and liquidity risk (esp if the bonds can be held to maturity).
  - Equity and property are expected to generate returns of at least CPI, however over short to medium term the market values can be volatile, although their income streams less so.
  - Equity and property are most suitable for matching future expenses to the extent that expense inflation might exceed CPI.
  - Short-term index linked liabilities could be matched by fixed interest stocks, to the extent that expected return includes an allowance for expected CPI, and deviations of actual CPI from expected are not likely to be significant over short terms.
  - Offshore assets might provide some protection against unexpected CPI increases (to the extent that these may be due to a weakening currency), however the link is loose and currency risk might be too high to absorb.
  - If the insurer is small, its equity and property exposure is better gained through collective investment vehicles to obtain adequate diversification.
  - Cash might be held as working capital and while returns are linked to CPI this is a very loose link.

- While the insurer will first consider its matching assets, there might be scope to deviate from a matched position (to maximise shareholder returns) if the free reserves are large enough.

iii. Equity-linked annuity:

- The assets should be invested to match the equity index, hence bonds are unsuitable.
- The insurer could try to replicate the index by purchasing all the stocks of the index, however this will be impractical for a number of reasons:
  - High transaction costs of frequent trading would result in the insurer's returns being lower than those required.
  - Purchasing and selling stocks at the same time as all other investors tracking the index would shift prices and make it difficult for the insurer to generate the required return.
  - Annuity inflows and outflows must be invested/disinvested in line with the index, and this may be impractical for small amounts.
- The insurer could adopt strategies used by specialist companies that track the index (e.g. use quantitative techniques to build a proxy portfolio that is easier to track), however implementation of these methods requires expertise that the company might not have.
- The most practical solution is for the company to invest in tracker vehicles or derivatives that track the equity index (and while these come at a cost, it should be less than the company trying to track the index itself).

*Overall this question should have been answered better by candidates given its simplicity.*

*Part (i) was generally well answered, although candidates often repeated points, e.g. requiring diversification or restrictions on foreign assets are not separate points to imposing maximums on assets or asset classes.*

*In part (ii) candidates generally did not provide a sufficiently broad range of points. A large number of candidates identified the annuity liabilities as "real in nature" and proceeded to suggest equity and property as suitable assets without showing an appreciation that these assets create a significant mismatch (and insolvency) risk.*

*In part (iii) a number of candidates simply stated that the insurer must "invest in the index" without discussing what that entails.*

## QUESTION 7

### i. Assumptions:

- The probability that the option will be exercised, at each possible exercise date.
- The additional benefit level that will be chosen, if this is at the discretion of the policyholder.
- The expected mortality of the lives who choose to exercise the option.
- The expected mortality of the lives who choose not to exercise the option.
- Additional expenses relating to the option.

### ii. Mortality risk:

- The company is exposed to the risk that more deaths than expected occur when the guaranteed minimum death benefit exceeds the unit fund.
- The exposure depends on the amount by which the death benefit exceeds the unit fund.
- The risk is greatest when the unit fund is low, for example:
  - At the start of the policy; or
  - If investment returns are poor.
- Full medical underwriting will help reduce the mortality and anti-selection risk at outset.
- However, the company is exposed to anti-selection at the five year anniversary.
  - The risk is that only lives in relatively poor health take up the option.
- The mortality risk relating to the option is also likely to increase if the take-up rate of the option is lower than expected, owing to increased variability and anti-selection.
- If selective withdrawals from healthy lives are more than expected this would also pose a mortality risk.
- The extent of the mortality risk depends on the degree to which mortality charges may be varied by the insurer.
- The risk is also dependent on the experience the insurer has regarding mortality and the exercising of such options.

### iii. Residual non-mortality risks:

#### Expense risk:

- The risk is that expense charges are inadequate to cover the cost of outsourcing the administration and other expenses such as overheads.
- The outsourcing agreement has reduced the company's exposure to expense risk, but there is still residual expense risk to which it is exposed.
  - The company is exposed to the risk that the administration company cannot continue to administer the business, i.e. exposed to credit risk.
  - If this happens the company might incur the following costs:
    - Once off costs in finding a new administrator.

- An increase in ongoing costs if administration cannot be sourced at the same costs as those guaranteed under the current outsourcing agreement.
- It could also suffer reputational damage.
- In addition to administration expenses the company also incurs overhead expenses on this product and it is still exposed to the risk that these expenses are higher than expected.
- The company is also exposed to inflation risk on these overhead expenses.
- The extent of this risk will depend on the variability of the expense charges.

Investment risk:

- The majority of the investment risk is passed on to policyholders due to the linked nature of the product.
- The matching of the guarantee reduces investment risk, but there is still residual exposure to investment risk.
  - The company is exposed to the credit risk on the counterparty of the derivative instruments used to match the guaranteed maturity value.
  - If the match is not perfect the company will still be exposed to some residual investment risk from the guarantee.
  - Also, if investment returns are lower than expected the company is exposed to the following risks:
    - Income from unit fund charges is lower than expected.
    - If charges are related to investment performance there is a risk that poorer than expected investment performance results in charges being insufficient to cover expenses.
    - Poor investment performance could lead to reputational damage.
    - Reputational damage could affect both new business levels and surrender rates.
    - Poor investment returns increase the mortality risk, as the sum at risk increases when unit funds are low.
    - The company is still exposed to the risk of investment returns being lower than expected on non-unit reserves.

Other risks that are not removed by the company's risk mitigation measures include:

- Risk of being uncompetitive and selling less business than expected.
- Risk of more withdrawals than expected when asset shares are negative (early durations) or below surrender values (penalties inadequate to recoup initial expenses).
- More withdrawals than expected, or lower new business than expected, will mean the overhead expenses may not be recouped.
- Risk of suffering large new business strains due to business volumes being much higher than expected.
- Risk of losses due to data errors, e.g. in pricing the option.
- Unit pricing risk.
- Operational risk, e.g. administration and fraud.

- Risk of marketing the product to the wrong market, marketing not being done effectively or mis-selling.
- Risk of losses due to regulatory or taxation changes which increase costs or administrative requirements.

*Part (i) was not answered as well as it should have been by many candidates. Many gave answers which were too brief, e.g. “mortality”, “take up rate” etc. Some candidates did not seem to understand what an assumption is.*

*Part (ii) could have been answered better by most candidates. Many were not precise enough with their answers to convince the examiner that they understood the points.*

*Part (iii) was answered reasonably well by the better prepared candidates. However, many candidates made loose and imprecise statements, leading to a loss of marks. Many candidates also failed to focus on the main risks (for which most marks were available).*

## **END OF EXAMINERS’ REPORT**