

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2015

Subject ST2 – Life Insurance Specialist Technical

Introduction

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

F Layton
Chairman of the Board of Examiners
December 2015

A. General comments on the *aims of this subject and how it is marked*

1. The aim of the Life Insurance Specialist Technical subject is to instil in successful candidates principles of actuarial planning and control, and mathematical and economic techniques, relevant to life insurance companies. The student should gain the ability to apply the knowledge and understanding, in simple situations, to the operation, on sound financial lines, of life insurance companies. The life insurance products covered by this subject exclude health and care insurance products covered by the Health and Care Specialist Technical subject.
2. The Examiners' Report covers more points than would be expected to get full marks. This is so that alternative approaches to questions by different candidates can be accommodated. Candidates are expected to show knowledge of the relevant content of the Core Reading, but those who tailor their answer to the specifics mentioned in the question will score more highly than those who answer in a more generic way.

B. General comments on *student performance in this diet of the examination*

As with previous papers, questions that focussed on knowledge of the Core Reading were generally well answered. In the non-standard questions, candidates often tended to restrict themselves by generating only a narrow range of points rather than thinking more widely, e.g. question 1(ii) and 3(ii). Similarly candidates did not perform so well in general on the calculation parts in question 2. Stronger candidates considered the specifics of the questions and used these in their answers. Candidates should use Examiners' Reports to practise applying their knowledge to the situations set.

C. Comparative pass rates for the past 3 years for this diet of examination

<i>Year</i>	<i>%</i>
September 2015	41
April 2015	45
September 2014	39
April 2014	46
September 2013	43
April 2013	42

Reasons for any significant change in pass rates in current diet to those in the past:

The pass rate is within the typical range. Some variation in the pass rate between sessions is expected as different cohorts of students sit the examination.

Solutions

- Q1** (i) Start from recent expense data and adjust older data for inflation to bring it up to date.

The expenses of the company can be split between direct expenses and overhead expenses. Direct expenses are those that are dependent upon the volume of new business or the level of in-force business. Overhead expenses are those that relate to the general management and service departments which are not directly involved in new business or policy maintenance activities and which are insensitive to the volume of new business and the level of in-force business. It is not always clear which category an expense belongs to, so judgement is required.

Commission is normally excluded as it is known and can be allowed for explicitly.

Non-commission expenses can then be split into initial expenses, renewal expenses, termination expenses and investment expenses. Initial, renewal and termination expenses can then be further sub-divided into those proportional to the number of contracts written or in-force, the amount of benefit written or in-force or the amount of premium written or in-force. The company would also need to obtain policy volumes, premium levels and benefit levels to relate to these amounts.

In practice most expenses are proportional to the number of contracts written or in-force. The exceptions to this tend to be marketing expenses, which may be proportional to the amount of initial commission paid and underwriting expenses, which may be proportional to the size of the benefit. Investment expenses are normally expressed as a percentage of the funds under management (and so can be treated as a deduction from the earned investment return).

The expenses may be split and analysed into the required cells. Typically these cells may be:

- the whole business of the life insurance company.
- the whole business of a particular accounting fund.
- each main product line of the company.

These may be further sub-divided by regular and single premium business. The cells should not be too small as to make the analysis unreliable.

The main items of expense are:

- salary or salary-related expenses.
- property costs.
- computer costs.

- investment costs (investment department, stamp duty, commission).

A potential way of splitting these costs could be:

Salary and salary related costs

Staff can be split into three groups:

- those whose work comes entirely within one cell.
- those whose work covers more than one cell
- and other staff.

The salaries of those whose work comes entirely within one cell can be allocated directly to that one cell. Timesheets can be used to split the salaries between the cells for those whose work covers more than one cell. The other staff salaries will comprise both overhead and direct expenses. The split between the two will need to be made pragmatically.

Property costs

If the company owns, as an asset of its long term fund, any of the buildings that it occupies, a notional rent needs to be charged to the relevant departments. This rent plus property taxes, heating etc. can be split, for example, by floor space occupied, between departments and then allocated in accordance to salaries.

Computer costs

The cost of purchasing a new computer could be amortised over its useful lifetime and then added to the ongoing costs. These can then be allocated according to usage.

Other one-off capital costs

Other one-off capital costs should be amortised across the expected useful lifetime of the item purchased and the amortised cost included as part of the overheads.

Exceptional items should be excluded completely from the analysis.

- (ii) The per policy valuation expense assumption would be derived from the expectation of total pension expenses, divided by the number of in-force policies where this spread across policies needs to take into account the future run-off pattern of the total expenses and the future run-off pattern of the number of pension policies.

The year 1 actual expenses are lower in 2014 compared to 2013; however we are not told about subsequent years' expenses and these may have been expected to be higher for the 2014 investigation than the comparable figures

for 2013. Higher expected total pension business expenses into the future would lead to an increase in the valuation assumption.

Higher expected future expenses in 2014 might have been the result of planned increased spending for this business line e.g. due to a change in administration outsource or due to an increased regulatory burden.

Or it might have been the result of increased expense inflation expectations.

The per policy valuation expense assumption may have increased due to a lower level of in-force policies at the investigation date or it may have increased due to a faster expected run-off of pension policies into the future.

The lower pension policy count at the investigation date may have been caused by higher actual deaths, surrenders or retirements over the previous year than were allowed for in the 2013 investigation.

The faster pension policy run-off may have been caused by an increase to the best estimate mortality, surrender or retirement assumption rates. The 2013 valuation assumption may have been determined on an open book basis, whereas the 2014 assumption may have been determined assuming that the company closes to new business. There may be lower expected future new pensions business or there may be less expected future non-pensions business, due to less new business or higher expected surrenders, meaning that the pensions business takes a larger proportion of overheads.

The company may have increased the prudential margin used in the valuation. This may have been due to a regulatory reporting requirements change or it might have been due to increased understanding of the uncertainty around the figure, e.g. through more volatility modelling.

There may have been a calculation error in producing either the 2013 or 2014 valuation assumption. The calculations should therefore be reviewed to confirm that they are correct.

There may have been a change in methodology.

Part (i) was answered well by most candidates. The strongest candidates logically stepped through the relevant core reading and covered all the elements required. In part (ii) stronger candidates considered various causes and covered a wider breadth of points, expanding slightly on each.

- Q2** (i) The expected profit is 10% of each premium.
 $= 844.75 \times 0.1 \times 14.6 \times 10,000 = 12,333k.$

Alternatively this can be calculated as:

$$\begin{aligned} &\text{Present value of premiums} - \text{expenses} - \text{claims} \\ &= (844.75 \times 14.6 - 100 - 100,000 \times .11) \times 10,000 = 12,333k. \end{aligned}$$

Alternatively, a revised unloaded premium could be derived.

The difference between this and the loaded premium can be valued:

$$\begin{aligned} \text{Unloaded premium} &= 844.75 \times 0.9 = 760.28 \\ \text{Difference} &= 84.47 \\ \text{Value} &= 84.47 \times 14.6 \times 10,000 = 12,333 \end{aligned}$$

- (ii) The expected profit is now:

$$\begin{aligned} &\text{Present value of premiums} - \text{expenses} - \text{claims} \\ &= (844.75 \times 14.95 - 100 - 100,000 \times .057) \times 10,000 = 68,290k \end{aligned}$$

Alternatively, a revised unloaded premium could be derived.

The difference between this and the loaded premium can be valued:

$$\begin{aligned} &(100,000 \times 0.057 + 100) / 14.95 = 387.96 \text{ new premium} \\ \text{Profit} &= (844.75 - 387.96) \times 14.95 \times 10,000 = 68,290k \end{aligned}$$

- (iii) A: As everything is shared 50% with the reinsurer, the revised expected profit would be:

$$68,290k \times 0.5 = 34,145k$$

- B: The revised expected profit would be:

$$(844.75 \times 14.95 - 100 - 100,000 \times .057 \times 0.5 - 100,000 \times .057 \times 2 \times 1.1 \times 0.5) \times 10,000 = 34,090k$$

[Note that since the mortality experience is assumed to be 50% of the table and the reinsurer based its risk premium rates on the original insurance company premium rates on an annually renewable basis, the present value of claims at actual rates multiplied by 2 can be taken into the calculation before the 10% loading.]

An alternative approach is:

$$\begin{aligned} &\text{Profit before reinsurance} + \text{claims received from reinsurer} - \\ &\text{reinsurance premium} \\ &68,290k + 100,000 \times .057 \times 0.5 \times 10,000 - 100,000 \times .057 \times 2 \times 1.1 \times \\ &0.5 \times 10,000 = 34,090k \end{aligned}$$

- C: The best estimate position is that there would be no catastrophic events and so the only deduction would be the value of 200k p.a. at 3% p.a. So the revised expected profit would be:

$$68,290k - 200k \times [1 - 1.03^{-20}] / 0.03 \times 1.03 = 65,225k$$

- (iv) Simply based on the above results, the company would be better off not reinsuring any of the risks as they all reduce the expected profit. This is due to the reinsurer's profit margin.

The major risk to this company is adverse fluctuations in mortality experience.

The company is small but expanding and hence capital is likely to be scarce. The company will therefore want to reinsure the mortality risk to avoid insolvency through a much higher than expected number of claims and through the reduction of any new business strain.

Treaties A and B reinsure the same proportion of claim amount and so provide the same level of cover for the claim volatility. Reinsurance with a financing arrangement may be the best solution.

The benefits or disadvantages of renewable premiums (offered under Treaty B) would need to be considered by the company.

The original terms reinsurance would reduce initial strain by more than the risk premium arrangement, if the payment of reinsurance commission is made at the start of the treaty, and so may be preferred from a capital perspective. The original terms reinsurance results in a lower reduction in expected profit than the risk premium reinsurance, so might be preferred from a profit perspective.

The analysis only considers what is expected to happen and ignores the possibility of a catastrophe. Such an event could have serious consequences for the insurer, so it may also want to take on catastrophe reinsurance (i.e. Treaty C) if the cost is reasonable, if the cover provided (30 lives) is felt to be adequate and if there is deemed to be the need due to geographic concentration or group business.

The technical support provided by the reinsurer may vary depending on the option chosen, so this might also influence the decision. Risk appetite may inform the level of reinsurance required. The cost of reinsurance should be compared to the cost of holding a mortality fluctuations reserve. The interaction between the treaties should be considered, particularly in terms of the order of implementation.

- (v) As risk is reduced through the use of reinsurance the company may be able to take greater risks elsewhere depending on its risk appetite.

There would be some benefits of not underwriting:

- Lower costs, e.g. no longer incur the expenses of the salary of the underwriter, medical reports, and further evidence.
- More people may take the product out (i.e. new business sales increase) as underwriting can be seen as a “hassle factor” delaying application or that it invades privacy.
- It may also be more attractive to distributors.
- Lower costs and/or higher sales would lead to higher profits.
- There will be quicker processing of new business.

In any case, non-disclosure and difficulty in policing exclusions make underwriting less effective.

On the other hand if the company takes on Treaty C only, there is still a need to underwrite as it isn't possible to gain information via underwriting for catastrophe.

And overall, what is being proposed would not be an advisable action because:

- There is likely to be increased anti-selection, i.e. people who have substandard health will choose to take out the product because there is no underwriting.
- Particularly since it is unlikely that all of the insurance company's competitors have stopped underwriting completely.
- This would lead to worse (i.e. higher) claims experience.
- This could outweigh any benefits from savings in underwriting costs or the higher sales volume, and hence could reduce overall profits.
- If premiums were increased to allow for the higher claims experience, healthier lives would go elsewhere which exacerbates the problem.
- Less homogenisation of risks can be achieved, and it will be more difficult to price the business.
- It is hard to identify sub-standard lives or set terms for these as no underwriting is in place.

- It is also hard to ensure that risks are rated fairly or that experience is in line with expected if there is no underwriting.

Increased uncertainty about the nature of the risks being written could result in needing higher pricing margins and higher margins in reserves and/or capital requirements.

Reinsurance terms offered will depend on the level of underwriting.

- So if underwriting is removed the treaties being considered are likely to increase in price.
- The offers may even be withdrawn completely and it could be difficult to find any reinsurance.
- Removal of financial underwriting could lead to over insurance.
- There will be costs associated with stopping underwriting, e.g. redundancy payments and literature changes.

The calculation parts, (i), (ii) and (iii), were not particularly well answered in general, with many candidates not performing any calculations for part (iii) and hence not demonstrating understanding of the underlying concepts of profit and reinsurance. The majority of candidates covered the basic points in part (iv) with the stronger ones considering a wider range of points, in particular those that would inform the decision, e.g. risk appetite and financing benefits. Part (v) was well answered in the main, again with stronger candidates considering a wider range of points on both the benefits and disadvantages of the proposal.

- Q3** (i) **Principle:** Should take into account policyholders' reasonable expectations. This scale should have been disclosed in the policy documents and other literature provided at the point of sale and hence should meet expectations.

Principle: Should not exceed earned asset shares, in aggregate, over a reasonable time period. It is difficult to assess this from this information given, as it is not clear what charging structure is imposed on the product. It is likely that in the early years the costs of setting up the policy will not be recouped from surrender penalties on what will be a small unit fund. So, at early durations, the surrender value could be greater than the asset share and the asset share may even be negative.

However, the shortfall between the "asset share" and the surrender value paid at these early durations will depend on the extent to which initial charges are taken from the product. Since it is expected that the overall charges would have been set to generate some profit to the insurance company on policies staying to maturity it is likely that the unit fund at maturity will be lower than

the “asset share”. Hence at later durations the surrender value is likely to be lower than the asset share.

In aggregate and over a period of time, whether this principle is met will therefore depend on the pattern of lapses.

Lapse and re-entry should also ideally be avoided. This surrender value scale achieves this through having a penalty which reduces by duration.

Principle: Should treat both surrendering and continuing policyholders equitably. There is no explicit scope for cross subsidies between surrendering and continuing policyholders. Except to the extent that surrender profits/losses have been allowed for when setting charges. However, the approach does not appear to generate excessive profits or losses on surrender, and hence seems to treat surrendering policyholders equitably compared with those who continue.

Principle: Should not appear too low compared to premiums paid in early years taking into account any projections given at the new business stage. The scale would apply a maximum 10% penalty in month 1, but the overall surrender value in the early years will be broadly in line with premiums paid in that it should increase in line with those premiums depending on unit growth. The comparison also depends on the allocation rate (or other initial charges).

Overall the 10% initial penalty plus other initial charges means that the surrender value may fall some way short of premiums paid at early durations. The projections at new business stage should have included the surrender penalty scale.

Principle: Should take account of surrender values offered by competitors and possibly also auction values, where available. Likely to be in line with these values, although no explicit information is available.

Principle: At later durations, should be consistent with projected maturity values. The sliding scale ensures that the surrender value is consistent with maturity values, so this principle is met well. In particular, surrender in the final month would pay the full unit fund, which is as for the maturity value (or slightly less, depending on whether the linear interpolation reaches 100% exactly at the maturity date or at the start of the previous month).

Principles: Should not be subject to significant discontinuities by duration. Should not be subject to frequent change, unless dictated by financial conditions. Should not be excessively complicated to calculate. Should be capable of being documented clearly. These principles are met for this method.

(ii) Profitability

There will be a need to assess the overall impact on profits. Existing policies would be less profitable based on the revised surrender scale as the amended scale is more generous in the first ten years of the policy.

However, need to look at whether the overall charging structure remains profitable. It is unlikely that charges can be increased to cover the additional cost and consider how the revised profitability will vary with duration in force. Profitability assessment will need to be based on best estimate assumption.

Would need to test the sensitivity of profit to changes in the key assumptions, particularly surrenders, expenses and unit growth.

There will be increased cross-subsidies between maturities and surrenders.

Surrender experience

The company would need to look at recent surrender experience. It may be that surrenders are relatively light, particularly in the last five years of the policy duration. In which case the impact of changing the scale may be limited.

However, a notification of change may trigger policyholders to actually consider surrendering. And hence future surrender rates may be different to those experienced before and this will need to be estimated. In particular, there may be higher surrenders in the last five years of the contract term as there is now no penalty. It will be hard to estimate future surrender rates as there is no data.

There is likely to be an increased surrender risk and the potential for lapse and re-entry should be considered. But this is unlikely to be an issue for this situation as existing policyholders will not benefit from lapsing and taking out the new product, either with or without the surrender value change. It is more likely that policyholders would surrender to purchase a competitor product or an alternative type of savings vehicle.

Treating policyholders fairly

Need to consider regulatory compliance and consider treating customers fairly. The existing surrender schedule is likely to have been included in the policy documentation. Need to consider whether the policy conditions allow a change. Would need to write to all existing policyholders to inform them of the new structure. It would be unusual for a unit-linked policy to change policy conditions over the lifetime of the policy. However, the change is to the benefit of the policyholders in all cases, so there may not be an issue.

Offering the same improved benefits to existing as to new policyholders helps to demonstrate that the insurance company aims to treat everyone fairly. This

may be seen positively by the regulator. There may be complaints from customers who had recently surrendered and there may be pressure to extend this to other product types.

Reserving

Need to consider financing requirements. The change in surrender penalties may require an immediate increase in overall reserves given that surrender values have increased and reserves may need to be at least as large as those values or if surrender penalties are allowed for in the non-unit reserves.

This is particularly an issue if actuarial funding has been used to determine unit reserves as this may require additional units to be purchased. Need to consider whether there is sufficient capital to support these increased reserves

Competitors and marketing

Would need to consider competitors' products and activities. If they are introducing these changes for existing business, there will be more pressure for this company to do so. Competitors' actions can also affect surrender experience.

The overall marketing messaging may be beneficial, given that this can be seen as considering existing and not just new business which may be positive for persistency experience and even for new business. These impacts should be allowed for when considering the overall effect on profitability for the company.

Systems/Administration

The computer systems, marketing literature, policy documentation and administration processes would need to be amended to reflect the new scale.

This will incur costs which would be need to be reflected in the cost/benefit analysis for the overall project.

However the admin will be simpler going forward as the two product designs will be consistent.

Part (i) was generally answered well with most candidates appreciating the need to step through the principles from the core reading and consider the extent to which they are met by the specific approach proposed. In part (ii), stronger candidates not only generated points that covered a breadth of areas but also expanded on each, covering the more detailed points in their solution.

Q4 (i) Components of an asset share calculation are:

- premiums paid.
- actual rate of return earned on investments.
- expenses.
- commission.
- cost of providing benefits in excess of asset share, e.g. life cover.
- any other options and guarantees.
- tax (if appropriate).
- transfers of profit to shareholders.
- cost of capital to support contracts in early years.
- contribution to free assets.
- surrender profits (or losses).
- allocation of profits/losses on without profits contracts.
- any contribution from free assets e.g. due to attribution or restructuring.

- (ii) The main risk to the policyholder is that the amount of benefit payable under the contract is insufficient for the policyholder needs or is materially lower than expected. This could be either on death or at maturity.

For example, if the policy is being used to finance a specific lump sum liability in the future, such as repayment of a mortgage, then there is a risk of a shortfall if the final payout is too small, depending on the extent to which this was based on the guaranteed or discretionary elements.

There is a risk of lower than expected bonuses. A performance shortfall is likely to be mainly due to poor investment performance, though it could also be due to high expenses, high miscellaneous deductions e.g. due to surrender losses or losses on without profits business or higher than expected deductions such as guaranteed mortality benefit payments. The smoothing of benefits mitigates these risks to some extent.

There is a risk of inflation in relation to the level of benefits paid, although the with profits element of the contracts will provide some protection against inflation, guaranteed benefits (e.g. if a fixed benefit is payable on death) will be eroded in value if inflation is high.

The policyholder carries some risk of the insurer becoming insolvent. However this should be less than if the company just sold conventional without profits contracts, as future surpluses may be used to maintain solvency, before being distributed to policyholders.

The policyholder is exposed to the risk of being unable to maintain premiums, for example, due to accident, sickness, redundancy, or other loss of income. And the benefit received if the policy is surrendered or made paid-up may not appear to be good value for money, particularly early in the policy term.

There is a risk that the policyholder's need change and the product is not flexible enough to meet these new needs. There is the risk that the policyholder does not understand the policy; therefore it may not meet their needs. There is a risk the policy was mis-sold, for example, if the policy was taken out to repay a mortgage on a house and the risks were not adequately explained.

There is a risk that changes in taxation may alter the value from the policy.

- (iii) The predicted terminal bonus is likely to be much higher for Mr A's policy than Mr B's. This may be due to Company A using a more optimistic view of expected investment (and other) performance in the projection over the final year than Company B. The two companies may have a different projection approach for the final year however, it is more likely to be due to Mr A's policy having a materially higher accrued asset share than Mr B.

This may be due to different investment strategies between the two firms resulting in higher overall investment returns for Company A. For example, Company A may have invested more in equities which, on average, would likely have produced a higher average return over a period of that length.

It may have been able to do this because it had a higher level of free assets and hence had more investment freedom to mismatch. Or even if the two companies had similar equity proportions, the choice of stocks may have been better for Company A. Company A may have switched into less risky assets, such as fixed interest or cash, just prior to a recent market crash.

The investment expenses incurred by Company A may be less than company B. For example due to the size of the funds under management, with Company A having higher overall funds and so benefiting from economies of scale and thus from lower overall expenses. Or the difference may be due to whether in-house or external fund managers are used.

Similarly for administrative expenses, which might be lower for Company A, e.g. due to having more efficient processes.

Company A may have paid lower commission on its with profits policies. Again, this may be dependent on the size of the company and the influence it can have on commission and distributors.

It will also depend on the distribution channel used, which could differ between the two companies, e.g. Company B might have used independent financial advisers, which require competitive commission levels, whereas Company A has its own salesforce.

Mr A may be younger than Mr B, or have a healthier lifestyle and hence the deductions for life cover may have been lower. Or the table of mortality assumptions used by Company A may have been generally lighter, e.g. because it generally sells to a lower mortality socio-economic group or

location than Company B. Or Company B may have suffered high actual mortality losses and charged these to asset shares.

The cost of capital charged may have been lower for Company A (or it may not charge for cost of capital). For example, Company B may have been newly established and so more capital constrained and therefore decided it was important to charge a cost of capital used to support its new business. Or similarly, any contribution to free assets may be lower (*could be zero*) for Company A.

Company A might not charge asset shares for the cost of guaranteed benefits, whilst Company B does. If both do charge, then the cost of guarantees might be lower for Company A e.g. due to lower expected volatilities or hedging approaches used.

Taxation may be more onerous in Company B e.g. due to the mix of other business written.

There may have been higher profit transfers to shareholders in Company B than in Company A because the shareholder proportion applying to the fund is higher (e.g. 20% rather than 10%) or Company A might be a mutual.

The grouping of policies assumed in the final bonus declaration may differ between A and B. For example, Company A may group over more policy terms, whereas Company B may group over fewer policy terms.

Company A might apply a different smoothing approach to Company B, e.g. it might smooth less or over a shorter period of time and there have been very good recent investment returns, so the Company A policyholders will gain more from such returns.

The two companies may be targeting different percentages of asset share for payouts.

In Company A, the amount paid on surrender may be much lower than in Company B and the profits on surrender are distributed as part of the final bonus.

In Company A there may be profitable without profits business which contributes to the asset share, but no such business in Company B. Alternatively, without profits business in Company B (in which with profits policyholders participate) may have been heavily loss-making.

One of the policy statements may be wrong.

Company A may have declared a one-off “special” bonus e.g. as a result of restructuring its with profits fund, e.g. distribution of estate.

The majority of candidates scored well in part (i), though a number listed bonus elements which scored no marks and did not demonstrate understanding of the distinction between asset shares and benefits. Part (ii) was also generally well answered, with the majority of candidates considering a reasonable range of risks. In part (iii), the stronger candidates covered a wide range of points with a small amount of detail on each. A number of candidates appear to have missed the statement made in the question that the reversionary bonuses had been the same to date, or did not appreciate the restrictions that this may have on the relevant points for the solution.

END OF EXAMINERS' REPORT