

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **EXAMINERS' REPORT**

September 2011 Examinations

### **Subject CA1 — Actuarial Risk Management**

#### **Paper One**

##### **Purpose of Examiners' Reports**

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 who are 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. Although Examiners have access to the Core Reading, which is designed to interpret the syllabus, the Examiners are not required to examine the content of Core Reading. Notwithstanding that, the questions set, and the following comments, will generally be based on Core Reading.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report. Other valid approaches are always given appropriate credit; where there is a commonly used alternative approach, this is also noted in the report. For essay-style questions, and particularly the open-ended questions in the later subjects, this report contains all the points for which the Examiners awarded marks. This is much more than a model solution – it would be impossible to write down all the points in the report in the time allowed for the question.

T J Birse  
Chairman of the Board of Examiners

December 2011

## **General comments on Subject CA1**

This subject examines applications in practical situations of the core actuarial techniques and concepts. To perform well in this subject requires good general business awareness and the ability to use common sense in the situations posed, as much as learning the content of the core reading.

The examiners therefore look for candidates to apply answers to the specific situation that the examiners asked, having read the question carefully. Too many candidates write around the subject matter of the question in more general fashion, and gain few marks. On the other hand, detailed specialist knowledge is not required nor is very detailed development of particular points.

Good candidates demonstrate that they have used the planning time well - an attempt to get a logical flow is a big advantage in making points clearly and without repetition. This also enables candidates to use the later parts of questions to generate ideas for answers to the earlier parts. Time management is important so that candidates give answers to all questions that are roughly proportionate to the number of marks available.

## **Comments on the September 2011 paper**

The general performance was slightly worse than in April 2011. As in previous diets, questions that required an element of explanation or analysis, such as Q3(i) and Q6(iv), were less well answered. The comments that follow the questions concentrate on areas where candidates could have improved their performance. Candidates approaching the subject for the first time are advised to use these points to aid their revision.

**1** The starting point of the product life cycle is the design of the general insurance product.

At the design stage risk management is used to optimise the capital requirements by taking advantage of diversification. The diversification can be optimised partly by balancing benefits that diversify each other. E.g. diversification by geographical region will be important.

Reinsurance can also be used, for example reciprocal quota share reinsurance to increase the diversification within the portfolio.

Alternative Risk Transfers could be used to aid the risk management of the business (e.g. Securitisation)

Underwriting stage: risk management is used at the underwriting stage prior to the acceptance of risk. The aim being an assessment of the potential risk so that each can be charged an appropriate premium.

Claims stage: risk management is used at the claims stage to mitigate the financial consequences of a financial risk that has occurred. Risk management is used to guard against fraudulent or excessive claims. However, the costs of implementing and maintaining a control system must be compared with the benefits gained from it.

Management control systems: Management control systems can be used to reduce the exposure to risk.

These include:

- Ensuring that the company holds and maintains good quality data on the risks it insures.
- Maintaining good accounting and audit procedures to enable proper provisioning and management of the risks together with maintaining accuracy of the financial position of the firm.
- It is important to monitor the liabilities taken on by the company. The company needs to continue to manage its risk exposure, in particular protecting against an aggregation of risks beyond an unacceptable level.
- Care of offering options and guarantees, particularly those that viewed as having little value as the value can change particularly if the market or other conditions change.

*Generally well answered. Many candidates wrote extensively about reinsurance and alternative risk transfer, but did not give sufficient attention to other risk management techniques.*

- 2** The State has a major role in the provision of benefits. This may be through direct provision, through encouragement of provision or through the regulation of provision from other providers.

The political, economic and fiscal viewpoints of the State will determine the precise roles that it will play.

Although the question refers to women, the actions will be suitable for all individuals without adequate pension provision, and the State may not wish to positively discriminate.

In this case, it is likely that the State will want to encourage provision from other providers. This would have the economic and fiscal advantage of making women better off in retirement and so less dependent on state benefits, and may also have political advantages.

They will need to educate about the importance of providing for the future. This could be done through a marketing campaign focusing on pensions required for a comfortable retirement and comparing this to any actual provisions made. Such a campaign would be via media that are suitable for the target audience

They could then educate or require education on the type of vehicles which could be used to provide this benefit.

They could regulate to encourage or compel benefit provision for those in employment; contributions could be made by both the employers and employees. The State could also add to these contributions, possibly as tax benefits. It could consider additional contributions to those on low earnings (more likely for those in part time employment).

The State could regulate to require equal pay/benefits for males/females.

The state could ensure that pension contributions continue to be paid when on career breaks (e.g. when on pregnancy leave)

The state could improve access for part time workers (these are potentially likely to be females)

A major problem will be with women who are not economically active for part of their working lives, for example because of childcare (or looking after elderly parents).

Benefit provision can still be made regardless of current earnings and it could encourage other providers to enter this market. Tax benefits or additional contributions may be needed to make this option attractive. This will only be suitable, however, for those with the finance available. For those without available finance the State may need to provide contributions.

Tax benefits could be targeted for the low income earners

The State could also provide some form of additional pension to those not earning or on low incomes.

If currently it is typical for women to have lower pension entitlements than men, the State could require sharing of pensions on divorce so that the ex-wife has more adequate pension.

The state could make spouses benefits compulsory rather than an option

The State will need to regulate bodies providing benefits, and bodies with custody of funds, in an attempt to ensure security for promises made, or expectations created. This will be needed to create confidence.

The State could provide financial instruments which could be used to make provisions for future benefits.

As an employer, the state could provide “adequate” benefits for their employees

*Disappointingly answered. Most candidates did not reflect sufficiently on issues particular to women such as maternity and childcare issues, or the prevalence of part-time working. Few candidates commented on the role of the government as employer.*

**3** (i) Formula:

- $S = A \text{ Sum}(x_i (1 + R_i)) - L$

Where:

- $S$  is the surplus at the end of the 5 years
- $A$  is the value of the assets at the start of the period
- $x_i$  is the proportion invested in asset  $i$
- $R_i$  is the return on security  $i$
- $L$  is the projected value of the liabilities at the end of the period

The aim will be to select the  $x_i$  to achieve the objective.

Mean variance portfolio theory can then be applied to minimise the variance of the surplus for a given expected return, treating the liability as a negative asset.

The main aim of the individual is to ensure that  $S > 0$ , but main priority is that it is at least 0 and therefore the portfolio theory could be used to decide on the  $x_i$  such that this is achieved most of the time (dependent on  $R_i$  and  $L$  movements).

It will need to consider not only the expected value of the liability at the end of the period, but also its variance and covariances with the assets.

A stochastic asset liability model could be used to do this.

But this probably not practical for an individual so may consider a more suitable approach (e.g. Scenario Testing).

(ii)

- The investor will have considered his attitude to risk.
- A low risk investor will want to ensure that they do not lose the prize money but ensure that it can at least help pay off some of the mortgage – i.e. may not be completely tied to paying off in five years. They could consider matching their position to ensure this happens
- A more aggressive investor might have chosen the assets with the aim of trying to pay off the mortgage at the quickest rate.
- The time frame is only five years and hence the selection of the assets may be dictated by the need to have liquid assets in five years time to achieve the objective.
- Will need to consider the tax position of each of the assets and the possible desire of the individual to invest in tax efficient products.
- Also may choose the asset with the lowest investment costs.
- The amount of money to invest may restrict the assets chosen.
- The investor may have a lack of knowledge/familiarity of some assets.

*Part (i) was poorly answered: many candidates did not explain how **portfolio theory** would be used to address the investigation of asset proportions in the investor's portfolio. Some candidates wrote as if maximising the surplus was the only priority, ignoring the prior objective of paying off the mortgage within five years with reasonable confidence in turn requiring a given return. Many that did get the bookwork out didn't add much to it.*

*Part (ii) was better answered, although points were sometimes made too generically. Many went beyond the scope of what was asked. That is they looked at other assets, income or liabilities. With short questions and a specific circumstance, candidates are advised to keep answers directly relevant.*

- 4** (i) The provisions will be calculated by discounting the estimated future payments due from the policies.

These payments will need to allow for any increases to pensions in payment (and if relevant in deferment).

Such increases maybe known in fixed (or real) terms and so have little actual material uncertainty.

However, such increases may be linked to inflation with a maximum or minimum. In such cases, a conservative view should be taken so as not to understate future payments.

Other sources of uncertainty arise from demographic assumptions e.g. mortality.

There is likely to be a large amount of policy information and also data available to derive such suitable assumptions.

Initially, such data could be used to derive best estimate assumptions then margins to allow for uncertainty could be incorporated.

In order to give a prudent provision, the margins should increase the best estimate provisions.

-The margin would be based on the uncertainty present in each assumption and the materiality of each assumption.

The margin could be a simple percentage for non-economic assumptions or could be derived from stochastic analysis for economic assumptions.

An alternative to including margins within the assumptions would be to add a contingency loading to the best estimate liability.

This approach is considered arbitrary as it is difficult to derive an appropriate loading.

Alternatively the allowance for uncertainty could be incorporated into the discount rate used to calculate the present value of the cashflows i.e. reduce it.

The more uncertainty there is the bigger the margins should be

(ii) (a) **Reported professional indemnity claim**

The insured event has occurred and a provision for the estimated claim payment(s) should be made. Hence there is no uncertainty over claim frequency.

As the ultimate claims cost could vary significantly and may depend on legal action, it may be difficult to use a simple estimated cashflow approach.

i.e. difficult to derive assumptions for calculating the ultimate claim since data from previous claims may not be relevant.

It would be possible to carry out an examination of the claim files to assess the reasons for the claim and the likely outcome, i.e. carry out a detailed individual assessment.

This information would be used to estimate the likely claim amount and possible variations – especially upwards.

Even this approach still leaves the risk of injury award inflation that a court might grant i.e. a significant degree of unpredictable uncertainty.

**(b) Syndicate insuring a space shuttle**

This risk is difficult to assess, as the available data is scarce.

However, the uncertainty is more around the chance of a claim since the amount of a claim may be more predictable (except possibly for compensation to relatives).

The provision could be set using the premium charged on the basis that this reflects an assessment of the uncertainty involved.

As this risk is difficult to assess, prudence may warrant transferring the risk where possible. That is, the provision would be the price someone else would be prepared to pay for it.

Hence, the premium a reinsurer would charge could be a prudent provision – it would allow for developments since the policy was issued.

Being a group of companies they could pool their expertise and data to come up with best estimate assumptions

**(c) New class of marine insurance**

A provision could be established using cashflow projections based on assumptions derived from other classes of business

The business could be similar to some already written hence existing data and variability of claims could be used.

If the business is novel or of a new type, a more conservative approach may be needed.

If a large part of the business has been reinsured or it is not material in the overall context, a more arbitrary approach may be acceptable.

In any event, as the business is new, the class of business is likely to result in volatile claims experience until the portfolio is large enough.

Hence the company may wish to use equalisation reserves to smooth the profit reported from period to period.



(d) **Extended warranty TV guarantees**

As the number of guarantees within this population is large, we can assume that the consequence of a payment (covering minor repairs to replacement of faulty televisions) follows a statistical distribution e.g. normal.

There will also be a lot of historical data upon which to base claims data (for means and variances) and ascertain trends or developments.

The policies will have known and relatively short terms. This will make deriving assumptions more certain.

Best estimate derived from expected number of claims multiplied by assumed average claim size.

The prudent provision can be derived using a suitable statistical distribution at a certain probability of threshold

*Generally good answers were made to part (i), although a significant number of candidates suggested that a higher discount rate would be used in establishing prudent provisions. The better answers were thorough on the detail, e.g. about which way to alter the discount rate and about the level of margins and what they were added to.*

*Answers to part (ii) did not reflect sufficient familiarity with the characteristics of the product lines set out in the question (or a failure to assess these). The most disappointing aspect was a failure to recognize and act on the key words in each section. For example a reported claim in (a), groups and short mission in (b), new **class** in (c) (the implication being that marine as a whole isn't new but this type is) or large and mature in (d). There were plenty of marks available for drawing obvious conclusions from specific words.*

**5** (i) There are two principal types of collective investment scheme; closed-ended and open-ended.

A closed-ended scheme, such as investment trust, once the initial tranche of money has been invested the fund is closed to new money.

To invest in a closed-ended scheme to after issue it is necessary to find a willing seller to buy a share from, and to disinvest it is necessary to find a willing buyer to sell a share to.

In a closed-ended scheme the price paid to invested, or achieved to sell depends on supply versus demand for the shares and therefore there can be a difference between the price and the net asset value of the share.

An open ended scheme creates or cancels units when there are purchases or sales respectively.

In an open ended scheme units are purchased and sold at the net asset value of the units.

The other difference between collective investment vehicles is their legal form. They can be set up and governed by company law or under trust law. Examples of different types of collective schemes are:

Investment trusts – These are closed ended schemes governed by company law

Unit trusts – These are open ended schemes governed by trust law

Open-ended investment companies (OEICS) – These are open ended schemes governed by company law

**(ii) Sector and Stock Choice**

Both the property unit trust and investment trust provide the investor with the opportunity to invest in a wide spread of property investments. The managers will have differing levels of experience and specialist expertise.

The difference in performance may be due to the funds having different objectives and hence investing in different types of property. Some areas of the property market may have performed better than others.

There may be an increase in supply in some areas of the market due to new developments which is not matched by demand. This could be due to the time lag between planning and completing a property development.

Economic growth can have a different impact on different sectors and different regions. Tenant demand and rental income may have changed and this will be reflected in investment returns and so will impact property values.

Investor preferences may also increase or decrease demand in some sectors of the property market.

The money available for investment in a given sector may have changed significantly, which would have an impact on prices.

**Structure of trust**

Differences may be due to the fact that the unit trust is open-ended and the investment trust is closed-ended. (e.g. tax differences or regulatory differences)

An investment trust can issue debt as it is a company, whereas unit trusts have limited powers to borrow against their portfolios. The gearing can lead to a difference in performance.

In a unit trust, the managers will buy in units offered to them when investors need to sell their units (although there may be a delay). For this reason unit trusts may need to be more liquid than investment trusts to ensure they are not forced sellers if faced with a high level of selling. This will affect their performance.

The price of unit trusts will be directly related to the underlying assets. The price of investment trusts will be determined by supply and demand. The price of an investment trust will usually be at a discount to net asset value, changes to the discount would affect investment performance.

Investors' preferences for property unit trusts or property investment trusts may have changed altering their relative attraction. This may be due to:

- change in the regulatory or tax regimes
- “fashion” changes or sentiment altering
- investor education undertaken by the suppliers of a particular asset class
- marketing by a particular company

The charging structure of the two trusts may be very different

(iii) For the company:

The company has issued a long term bond and therefore has guaranteed borrowing for the entire term of the bond.

The maximum coupon means that the company knows the maximum cost of the borrowing.

The three month coupon agreed in the auction will be related to money market rates the cost of short-term borrowing.

The company has the upside that the borrowing cost paid will be less than the maximum rate, and will be hoping that the coupon it has to pay will be lower than the maximum.

But this will result in some variability in the coupon paid, and so potentially borrowing costs higher than budgeted for when deciding how to invest the capital raised.

Costs of the auction process will be borne by the company.

For the investor:

At the time of issue, the maximum rate will exceed 3-month market rates. Therefore provided this continues to be the case, the coupon agreed in the auction should be very similar to other money market interest rates.

The presence of a maximum coupon will mean that there is the risk that when money market rates rise the coupon paid will be lower than money market rates.

If this happens, the auction would fail: that is, the market wants a higher yield than the maximum rate and therefore the price of the bond should fall to reflect that higher yield.

So an investor who purchased a money market like security can suddenly end up holding a long-term fixed rate bond, a very different investment.

This risk should be reflected in the coupon bid in the auction with higher than money market rates being bid and therefore higher returns achieved.

The coupons bid in the auction will reflect money market rates, a margin above this to reflect credit risk and a margin to reflect the risk that there will not be bids less than the maximum rate.

Each of these elements will change over time, for example it will become more likely that the maximum rate applies when money market rise or the credit risk rises.

In the situation where the maximum coupon applies, the security will then behave more like a long-term bond. But with the risk that the coupon will fall at subsequent auctions, which risk would be reflected in the price paid by an investor who wants a long-term fixed income.

The investor will be concerned with the marketability of the bond within the 3 months – if they need to sell in the time between the auctions will they be able to.

*In answering part (i), many candidates seemed to believe that investment trust prices were “set” by managers relative to NAV, rather than being determined by market supply and demand. A number of candidates seemed confused about “open” and “close” ended characteristics of the vehicles.*

*On part (ii) most candidates got the majority of the points.*

*Answers to part (iii) were generally weak, with candidates showing little appreciation of the impact of money market conditions on the auction results. Many did the right thing on “hard” questions and developed the obvious basic points and what flowed from them. Some candidates did not differentiate between the risks for the company and investor as asked, for example the term of borrowing is known for the former but not the latter.*

**6** (i) The first step is to look at the types of weather that would cause problems.

This is likely to cover rain or snow (too much), temperature (too hot or cold) and maybe strong winds or storms.

Two sets of issues arise: weather that disrupts and weather that ruins.

Hence for each condition, criteria that would cause problems at each level would be set e.g. ruined if below freezing say or disrupted if between 30 and 40 degrees.

For each weekend, for each condition, it would be necessary to estimate probabilities of both ruinous and disruptive weather. For example 25% chance of a major storm or 30% chance of uncomfortable heat say.

Criteria would then be set to exclude particular weekends e.g. reject if say more than 10% chance of ruin conditions and/or say 50% chance of disruptive conditions

Could reject if failed for a combination.

- (ii) It is important to clearly establish the purpose of the model. Here we want to estimate chances of various types of weather in a very specific location on specific dates at points in the future.

The extent to which the data is appropriate can be measured by applying some form of confidence interval. For example, the chance of a major storm is estimated to be 20% but it could range from 5% to 40%. This is likely to be a very approximate assessment.

The most complete data available is likely to be the least useful.

It will be necessary to look at past data to ascertain the level of correlation between national and regional information and our local conditions. This will give the relative importance of the different sources and hence the extent to which they are relevant.

Much will depend on how much and which local data is missing. For example whether detailed records go back say 100 years and then don't exist at all or whether gaps in more recent data are present.

Local conditions are volatile but good data may throw up patterns that suggest certain conditions are more likely e.g. the first weekend in June has been warm and sunny in 75 out of the last 100 years.

The longer the period for which useful data is available, the more fluctuations can be smoothed out and hence more accurate predictions made.

Such fluctuations can extend over longer periods (as well as being random year on year). For example hot summers may run in cycles.

Hence it may be possible to identify trends over time – hence making recent data more valuable if it is part of a trend.

It is possible that global warming or other trends means that older data is no longer relevant or that fluctuations are becoming more unpredictable.

Any possible developments of such trends and patterns noted above need consideration given the gap until the events.

It will be necessary to check that what is recorded is consistent and presented in the same way (Fahrenheit v Centigrade say). Hence some adjustments may be needed.

Likewise, technology may mean that older data is less accurate e.g. obtained using poor instruments, or by well meaning amateurs.

Similarly, there may be issues with interpretation or clarity. For example handwritten data on crumbling paper recorded by a Bavarian monk in an obsolete language may have to be worked on.

- (iii) The date of the founding charter may be widely known and be the basis of smaller regular celebrations

Likewise a date associated with a local hero or patron saint may be significant.

It may be desirable to tie celebrations into periods of local holidays or festivals (e.g. musical or dramatic) so as to promote citizen participation.

Likewise, periods of national or regional holidays may boost visitor numbers.

But it will be important to avoid clashes with other regular festivals or events that could be viewed as competition (for customers or suppliers).

Similarly, if the country was holding a big one-off event e.g. world cup then this could be a distraction.

The need to obtain permits or licences (e.g. to sell alcohol on religious holidays etc.) could dictate which dates are available.

- (iv) The main difficulty with a full transfer could be assessing the extent of any financial loss for the purposes of traditional insurance.

Costs of preparations, building etc. would be incurred whatever the outcome and so are unlikely to be viewed as losses by insurers.

Losses will relate to low revenue e.g. fewer visitors spending less.

Or damage to reputation e.g. they create a bad impression and future trade or visitors suffer.

Such amounts are very difficult to quantify or express in monetary terms. For example what are target receipts?

There is the difficulty of defining and measuring the risk event e.g. what would trigger any claims and who would verify them.

For example was bad weather the problem or poor preparations or marketing – there is scope for a lot of dispute.

Who suffers the loss and who is insured? The town may suffer e.g. lower tax receipts but local businesses would as well. How will premiums, losses and claims be allocated?

It may be possible to obtain insurance that pays out if bad weather occurs, but unlikely that the claim payment received would fully cover the losses.

Other ways of transferring risk suffer from similar problems. For example, selling tickets in advance may be tricky due to uncertainty and purchasers may want their money back if problems arise. Though ticket revenue for specific events say could be insurable.

Money could be raised from sponsors or advertisers but again they may want some guarantees or protection. They may not want to commit too early.

Possible to obtain insurance for fixed amount payable on certain adverse weather events, but this only partially covers the risks.

*There were generally poor answers to part (i), few candidates reflected sufficiently on the distinction between “disruption” and “ruin” of the planned event. Many did not reflect how the historical data would be used to assess the probabilities of threshold criteria occurring at particular times.*

*In this case simplicity and practicality are paramount, given the circumstances.*

*On (ii) many showed a good awareness of potential problems with the data given the situation, and how these could be overcome given the right circumstances. Responses that were too generic on data issues lacked quality and did not score well.*

*Most candidates got the majority of marks for part (iii), although there was a tendency to repeat the same underlying point.*

*On part (iv) few candidates were able to address more than the problems of placing the risk due to its one-off nature or observing that insurance would be expensive. Few considered deeper issues such as defining (and if necessary later agreeing!) the risk event and the problems caused by non-financial losses.*

## 7

(i)

- Monitoring the experience is a fundamental part of the actuarial control cycle.
- The actual experience of a provider should be monitored to check whether the method and assumptions adopted for financing the benefits continue to

be appropriate and, if not, what changes should be made in order to achieve the desired level of profit.

- The experience will be monitored so as to:
  - Update assumptions as to future experience
  - Monitor any adverse trends in experience so as to take corrective actions
  - Provide management information

(ii)

- The company will seek to compare the actual deaths it has experienced with the expected death rates when the contract was designed, or with those in the current supervisory valuation basis.
- The basic calculation is to divide the number of deaths by the matching exposed to risk.
- The aim will be to split the data into the homogeneous groups while keeping the volume of data within each group credible.
- Experience should be looked at net and gross of reinsurance.
- It is important to be clear about the definition of the exposed to risk for the denominator of the ratio.
- Normally this will be the average of the in-force policies at the year start and the year end (but more accurate if the data is available).
- Data should only reflect the scheme that is being considered so some data checks should be done.
- The most important levels at which to carry out the investigation are:
  - Sex
  - Pensioner versus Dependent
  - Age – i.e. is any age band dominating the number of deaths
  - Pension Size – is the experience dominated by one or two individuals with very large pensions dying and hence not reflective of the whole scheme
  - Location (if available) – given that the manufacturing company is based over the country is the number of deaths based in any particular location and how does the experience differ in other locations
  - Type of occupation – i.e. is there any difference between staff experience and executives' experience
  - Duration since pension commenced
  - Smoker/Health status (if the company has this information)



- Is there any particular reason why the mortality experience is heavier than expected that should be taken into account (e.g. were the workers exposed to chemicals/asbestos that has only come to light now).
- May want to consider if any experience of the scheme before the three years is available and see if this is in line with the experience it has seen (probably should have asked for this at the pricing stage).
- If available may want to consider if the members that have died retired due to ill health or normal health (again this should have been looked at during the pricing stage).

(iii)

- The initial expenses of setting up the scheme could have been lower than expected.
- The investment assumption used in pricing might have been over achieved – and there could have been lower than expected defaults meaning that more profit has been achieved.
- The expenses of maintaining the scheme may have been lower than expected, or there may have been lower contribution to fixed costs and overheads.
- If the pensions have escalation related to inflation then if the inflation cost had not been hedged at outset then it may have been lower than expected, alternatively if it was hedged it could have been done at a lower rate than anticipated in the pricing.
- Legislation could have changed in favour of the life insurance company.
- Claims management (checking annuitants are alive) may have reduced the cost of claims.
- On death of the pensioner the spouses benefit may be lower than expected (or the pensioner did not have a spouse where the company had assumed they did)
- The company would have added a profit loading into the product, everything has gone as assumed and the profit has emerged

(iv)

- The use of this analysis for other schemes will depend on the industry of the other schemes that the company is aiming to win, if it is another manufacturing company then the analysis might be useful in indicating possible mortality assumptions. Equally if the experience reflects the experience of the county then it might be useful

- However if the scheme is in a different industry then the analysis might not be suitable for use in the new schemes (e.g. experience of a financial company will probably be very different to a manufacturing company).
- The different locations' experience could be used to see if there is a bias to certain location (e.g. in the UK, North having heavier mortality compared to the South).
- The analysis could be used in conjunction with other schemes or individual annuity mortality experience to see if any rating factors could be used in order to help price schemes better in the future.
- Could be used to reflect any difference in pension size (those with smaller pensions may have heavier mortality) again this could possibly be used in the new schemes pricing basis.
- Use will also be dependent on how many lives (years of exposed to risk) is available – if the scheme won before was only a small scheme with few lives then the data is unlikely to be credible and hence using in future schemes may not be suitable.
- The experience has only been done over three years and this is not sufficiently long to base any future schemes pricing on.
- Future medical advances may lead to a reduced number of deaths (mortality improvements) and hence the experience may not continue and hence choosing to use for new schemes may not be suitable.
- If the experience has been affected by one-off impacts (exposure to asbestos) then again this may not make it suitable for pricing new schemes.
- The experience may give the company a better understanding of the base mortality tables (split between male/female) and therefore may want to adjust the standard pricing mortality tables.
- This scheme may have had a higher proportion of ill health retirements and hence more likely to have higher than expected mortality (especially if this was not taken into account at the pricing stage).
- Will need to consider the mortality experience of the schemes it is targeting as well as considering the base assumptions.
- Should also consider the competitive position, the information that has been obtained could be used to the company's advantage

*Question 7 was generally answered reasonably well.*

*Most candidates scored well in part (i) although some went into far too much detail and hence failed to see the wood from the trees. Some failed to draw out the consequences of establishing adverse experience or trends.*

*Part (ii) was well answered although a few took completely the wrong approach by over complicating what is in essence a simple deterministic investigation.*

*Responses to (iii) and (iv) were reasonable, although some included issues relating to active and deferred members, which categories were not mentioned in the question.*

## **END OF EXAMINERS' REPORT**