Subject CA1 — Actuarial Risk Management
Paper One

September 2009 Examinations

EXAMINERS REPORT

Introduction

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

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Chairman of the Board of Examiners

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Comments for individual questions are given with the solutions that follow.

<u>*General comments*</u>

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 main weakness that candidates continue to show is an inability to answer the question 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. 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.

The notes that follow are not to be interpreted as model solutions. Although they contain the majority of the points that the examiners were looking for, they also contain more than even the best prepared candidate could be expected to write in the time allowed in the examination room.

1

(i) Require the insurer to close to new business

Require it to establish a recovery plan

Arrange for the state to take over the insurer (nationalisation)

Facilitate a merger/acquisition with another insurer

(ii) Estimate future premium income and claims outgo from existing business

Current value of surplus assets

Amount/timing of loan/debt repayments

Staff relationships and redundancies

Considerations on staff benefit schemes (especially if in deficit)

Outstanding financial obligations, unpaid tax, creditors etc.

New business either volumes or cash-flows from it

Investment strategy eg matching

Expenses

In part (i), the better candidates scored well, giving succinct lists covering the main points without repetition.

In part (ii), too many discussed assumptions or looked solely at current solvency without looking to what may happen in the future. The better candidates looked at sources of revenue and costs as well capital issues.

2

(i)

a. For a risk to be insurable:

- The policyholder must have an interest in the risk being insured
- A risk must be of a financially quantifiable nature.
- The amount payable in the event of a claim must bear some relationship to the financial loss.

b. For a risk transfer to take place:

- The price at which the insurer is prepared to quote must be less than the perceived cost of the risk to the prospective policyholder.

(ii) To protect from anti-selection.

To identify risks for which special terms will need to be quoted.

For substandard risks, to identify the approach (e.g. decline) or the level of the special terms to be offered.

To aid in risk classification, which helps to ensure that all risk are rated fairly.

Underwriting at the claims stage can help prevent fraudulent or excessive claims and so help ensure that claims experience does not depart too far from what was assumed in the pricing basis.

To help reduce the risk from over-insurance (via financial underwriting).

(iii) Fluctuations in mortality experience will be the most important factor affecting the profitability of this line of business. Higher than expected claim amounts could affect the solvency of the company.

This is because there is no savings element to the policy. Hence the reserves built up are relatively small since the chances of a claim under each policy are relatively low.

The amounts payable on a claim will thus be high relative to the reserves held and premiums payable. Therefore high claims will cause capital strains.

The company is small and a significant part of its business is from these policies. Hence it is unlikely to have other resources to cope with poor claims experience from its term assurance business.

Term assurance business tends to be without profits. Hence there are few margins in the premium rates to help cope with poor experience.

Likewise, this line of business tends to be very competitive causing pressure to keep premium rates low.

This company is likely to use reinsurance for this class of business. Strict underwriting may keep reinsurance premiums low.

Parts (i) and (ii) were straightforward bookwork and many candidates scored well.

Part (iii) requires some application to the particular case, picking up on the key characteristics set out. Weaker candidates merely repeated their comments from (ii).

3

(i) Operational risks are the risks that the company may face in managing its operations.

They can arise from:

- Inadequate or failed internal processes people or systems. For example, in this case a lack of clear managerial responsibilities leading to deadlocks or succession problems.
- The dominance of a single individual (or group of individuals) in the running of the company. This is clearly relevant for a family firm where strong personalities may exist.
- Reliance on third parties to carry out tasks for the company. This company may not have the resources, for example, to employ professional legal or accounting staff.
- The impact of external events on the company's operations. For example, events that affect customers or suppliers will have knock-on consequences for this company.
- In particular, the failure to provide for mitigation against the effects of external events such as natural disasters or criminal activity (eg staff fraud).

(ii) An actuary (with suitable expertise) could provide advice regarding identification, assessment and management of risks (in general) and in particular in this case:

A Protection against financial losses to the company arising from employees' death or ill health in particular for key staff. They could also advise on the levels of benefits to pay to employees (or their dependants) in such circumstances.

B Insurance protection of tangible assets or against claims for liability or business interruption (consequential loss)

C Provision and design of benefits and remuneration packages. Both for employees and members of the family or other executives. In particular contribution rates for retirement benefit schemes.

D Interpretation and reactions to legislation or taxation policy.

E Managing the costs of running the company.

F Quantification of the amount of surplus capital in the business.

G Distribution of surplus capital

H Investment policy, in respect of both the company's assets and the assets of any employee benefit funds

I Raising additional capital.

J Project appraisal.

K Negotiations with outside parties (e.g. banks, investment managers) or liaising with other advisors.

This should have been straightforward, if candidates applied their answers to the question. Weaker candidates overdid a few areas and so did not answer sufficiently broadly.

4

(i) Ideally data to be analysed should be split into homogeneous groups, for example, by age, sex, smoker status, geographical location or particular website/search engine.

As the investigation is being completed within the first 5 years, this may be within the select period and hence the data may not be representative of long-term experience.

However, where data is scarce, for example numbers of deaths at young ages, splitting data into homogenous groups may result in data groups that are too small to enable any credible analysis to be carried out.

In such cases data may need to be combined into groups which are less homogeneous, but which are large enough to be credible.

Whenever data is to be analysed there needs to be a balance between splitting the data into homogeneous groups and having sufficient data in each group to enable a credible analysis to be carried out.

The reduction of heterogeneity within the data for a group of risks makes the experience in each group more stable and characteristic of that group, and enables the data to be used more appropriately for projection purposes. This is important when monitoring mortality experience.

Any heterogeneity in data groups will serve to distort the results and can lead to setting provisions that are too big or too small and calculating premiums that are incorrect.

There is also a need to carry out sensitivity testing to check that if the data are grouped in a different way the same results are obtained.

(ii) The company may have been conservative in setting its mortality assumption for this business as it had no previous experience of the internet market (i.e. a lack of data).

It may also have deliberately over-estimated mortality to keep business volumes low until experience became clearer

This business may be subject to a different underwriting process (e.g. only small number of strict questions) and the company may have made the wrong assumption about the effects of such practices on experience.

General population mortality may have improved over the past five years by more than anticipated in the pricing basis.

There may have been random fluctuations in the experience data

The data used for the experience analysis may have been inadequate eg the heterogeneity problems in (i) may be present).

The company may have based the pricing assumption on existing experience adjusted to allow for the different sales channel. This adjustment may have turned out to be inaccurate.

(iii) There will be a single premium rate for males and females. Before the change, female rates would generally be cheaper than male rates

The premiums could be priced on the existing male/female split. This would lead to an increase in female rates and a decrease in male rates.

Each company in the market is likely to have a different male/female split in its existing business and so rates will vary in the market.

However, commercial pressures may in effect force the company to end up charging rates based on the industry male/female split.

For example, if the company had more males than the average, its rates would be higher and so they may have to be reduced to attract more business.

Conversely, a company with a higher proportion of females would start with a lower rate, which would attract a lot of business – in particular, males hence rates would tend to rise.

Subject to (or deliberately accepting) the problems involved in having rates that are too high, the company may take a very prudent approach so as to reduce business volumes until experience becomes clearer.

The company may need to focus on increasing the proportion of female policyholders. They may use marketing or add on additional features or try to differentiate the product in another way.

It may be necessary to introduce stricter underwriting standards (eg reject more low quality males).

Given the likely change in business mix, the impact on other rating factors will need to be considered i.e. are different men or women being attracted because of the common rates.

The company can also consider using national statistics or industry statistics from the start to give the male/female split.

The male/female split will need to be monitored very frequently to ensure that the mortality assumptions used are appropriate.

In part (i), most candidates scored for commenting on the desirability of homogeneity, but too few explained why it is important. There was a wide variation on part (iii), with better candidates considering the competitive issues in practice.

5

(i)

- To determine the liabilities to be shown in the company's published accounts and help to show the cost of accruing benefits (eg last years' pension cost).
- If separate reports have to be prepared for the purpose of supervision or solvency, to determine the liabilities and costs to be shown in those reports
- To disclose the overall solvency/funding position to members eg via scheme accounts.
- To determine the liabilities and costs to be shown in internal management accounts.
- For the purpose of valuing the liabilities in respect of employees involved in mergers or acquisitions.
- To compare with the existing assets of the scheme, and hence decide how to spend a surplus or correct a deficit, for example introduce benefit improvements or amend contributions.
- To set future contributions for the scheme.
- To value benefit alterations or the cost of discretionary benefits.
- To assess the implications for investment strategy.
- To assess changes in experience e.g. salary or withdrawals.
- On discontinuance or buy-out of all or part of the scheme.

(ii) Provisions are calculated for a range of different purposes. Different assumptions are appropriate for different purposes. In particular, the treatment of uncertainty will vary with the specific purpose.

The legislation governing the calculation of provisions for accounting and regulatory supervision may be different. Hence different approaches or assumptions will be required for each set of calculations.

Regulators may want provisions to be calculated with margins for prudence. This will help to ensure the solvency of the scheme.

The assumptions may be dictated by legislation or left to judgment with a requirement for disclosure of the assumptions used. Where judgement can be exercised, a range of figures may be produced to show the effects of different future experience.

This may be particularly relevant to the funding or costing discretionary benefits or other alterations where a range would be useful but a generally cautious approach may prevail.

Shareholders and potential shareholders make decisions on the basis of information in a company's accounts. It is therefore preferable (to the extent allowed by legislation) for values to be included in the accounts that represent an actuary's "best estimate" of the future experience.

In any event, figures prepared for internal management use or for some funding calculations should be on a best estimate basis.

It may be necessary to transfer liabilities and assets from one party to another eg on a bulk transfer, a buy out or discontinuance. In such cases the values being placed on benefits and assets have a real monetary value.

It is therefore important that both the transferring and receiving parties view the terms of the transfer as being fair. This is likely to involve reference to current market conditions and investment strategy.

Different actuaries will represent each side. It is likely that each actuary will, representing their clients' interests, have different views as to the appropriate assumptions. Provisions calculated on a range of assumptions will therefore form the basis for negotiations.

(iii) In general when valuing options and guarantees a cautious approach is taken.

With options, there is a risk of selection against the scheme.

In placing a value on options when setting provisions it may be appropriate to assume the highest cost option is always exercised –this may mean the provisions are too cautious.

However the scheme rules or eligibility conditions may have been framed in such a way, that always favour one option over another. Hence the "choice" as to which option to value is easy.

With guarantees there is a risk that the guarantee will apply and so the costs will be greater than would otherwise have been the case.

The value of a financial guarantee will normally be assessed using a stochastic model. The parameters input to the model should reflect the purpose for which the results are required. For example are we looking at a best estimate or a worse case scenario?

The purpose may also drive the approach in terms of legislative requirements.

(iv) When valuing the option, assumptions will be needed as to how many retirees opt for the cash sum and how much cash (up to the maximum allowed) each chooses.

Since it may not be possible to predict whether the guarantee will be attractive in future years, a stochastic modelling approach may be needed to derive these assumptions.

If the guaranteed rate is likely to be beneficial to the retiring member (i.e. greater than the relevant annuity factor that would otherwise be used to value the pension), then the valuation should assume that all members take the maximum cash sum allowed.

If not, in theory, members will take all their benefits in the form of pension.

However, many members will prefer cash to pension irrespective of the relative values eg due to the tax treatment of pensions. Hence it may be acceptable to assume that a proportion of retirees opt for the less valuable benefit.

It may be necessary to allow for anti-selection in that the mortality experience of retirees may vary depending on the option they select.

Parts (i) and (ii) were generally answered well, though many candidates wasted time by giving unnecessary detail (for instance on specific assumptions). Part (iii) was less well answered, with many candidates concentrating too much on the cash option, effectively answering part (iv), and others going beyond valuation/provisioning.

6

(i) Essentially, the reasons can be grouped as being due to relative cost, flexibility or control.

In an environment of low interest rates it is likely that the **cost** of short-term borrowing would be low.

Similarly, if inflation and inflationary expectations and hence expectations of future interest rates were low then longer term borrowing costs would also be low.

Alternatively, equity markets could be low so increasing the relative cost of equity capital.

In general it may be more beneficial to the existing shareholders to raise finance via borrowing than giving up part of any future growth to new shareholders i.e. they do not wish to see a dilution of earnings. Alternatively, existing shareholders may be unable or unwilling to raise funds for additional equity stakes.

In relatively benign economic conditions, financial institutions may view risks (especially short term) as being low hence they may be willing to lend a lot of money at low rates. Cheap money may be available e.g. due to Government policies.

Given the nature of the company it may have a good reputation or track record and hence a high credit rating. Given also that a lot of cash may be being raised, the company may be in a strong position to negotiate favourable borrowing terms.

It may be more tax efficient to pay interest on loans than equity dividends (or reward investors via capital gains).

Raising debt may involve lower costs/fees than raising equity.

Short-term borrowing gives the company **flexibility**. It will be relatively easy (and cheap) to adjust its borrowings (repay or raise more) as circumstances dictate. Equity capital may not be as flexible e.g. share buy-backs and new issues are complex to perform.

Similarly, the company can tailor the type of bonds it issues (income and capital proceeds) to its expected revenues but also introduce features (e.g. options) that may make re-financing easier should it be required.

The company may simply not want to cede any **control** to outside shareholders. They may have a clear strategy and strong opinions and don't want external interference e.g. appointing directors chosen by these new shareholders.

This may be particularly relevant if raising capital would require a stock exchange listing.

Such a listing may require compliance with many regulations or conventions that the company would find tiresome or costly. For example there may be rules on disclosure, corporate governance, preparing reports, holding meetings and communications.

Outside investors especially institutions may exert pressure to generate short - term results in a manner that doesn't suit the company's business model.

(ii) The general point is an inability to service the debt.

Short term borrowings are likely to be at variable rates of interest. Interest rates may rise significantly.

Similarly, if loans or bonds need to be re-financed at the end of their terms, rising interest rates will increase costs.

In particular, in times of economic uncertainty, increasing risk margins will increase borrowing costs.

There may be a mismatch between revenues and borrowing repayments for example if any disposals were delayed. This could cause cash-flow problems (borrowings must be repaid, dividends can be cut) and increase the need for short-term finance. This may lead to more volatility in earnings for shareholders.

In a downturn, revenues may fall or the prices obtained on disposals may be lower than expected. This could cause problems if coupons and redemption payments on bonds are fixed.

The company may be caught in the pincer of falling revenues but higher costs if problems in the economy are caused by higher real interest rates. Thus there is a real risk of insolvency.

Similarly, in a deflationary environment, the real cost of debt may be high if interest rates do not fall correspondingly.

The company may be expecting to squeeze value out of the conglomerate in order to service its debts. Failure to produce revenue gains or cost savings in a timely manner will cause difficulties.

It is likely that borrowings will need to be secured against some assets. Lenders may insist on security coming from existing (pre-purchase assets). This could constrain the company's operations.

Likewise, higher gearing could affect the company's credit rating, cause it to breach banking covenants and adversely affect its image or ability to conduct its operations.

If difficulties did arise, the company may be forced to swap debt for equity on unfavourable terms and lose some control over its operations.

(iii) This is the way many private equity companies operate. In effect, they want to identify undervalued assets and make a profit by exploiting the situation either via sales or improving businesses they choose to keep.

The view is that the conglomerate will be worth more if split into its component parts compared to its value as a group.

It may be possible to find buyers for each subsidiary who would pay more than the company, in effect, did for the particular subsidiary.

The company is likely to have raised a lot of cash to fund the purchase. These debts will need to be serviced. Making profits on relatively quick disposals will reduce its borrowings fairly rapidly. Such debt may not be manageable in the longer term if the company is over-geared.

The company may need some time to make each subsidiary attractive to potential buyers hence the 1year window. This window will also apply simply because it will take time to do all the analysis required.

They are not disposing of all of the subsidiaries. They may choose to dispose of the subsidiaries that don't fit in with their existing assets or that lead to over-concentration. In effect they will cherry-pick the subsidiaries, which they think have good long-term growth prospects perhaps due to synergies with existing businesses. Alternatively, competition regulations may force some disposals.

The existing management of the company may have skills in certain industries or types of businesses. One method of improving the conglomerate will be to bring in this expertise and new management techniques. Hence certain subsidiaries will not be suitable to be kept.

The company will not want to spread its management expertise too thinly. They will only have limited capacity to cope with new businesses. Hence part of the conglomerate will have to go.

(iv) The main criteria will be financial.

Though other more subjective factors such as those discussed in (iii) will play an important part

The ultimate determination will depend on to what extent and how each subsidiary can enhance shareholder value.

There may be two broad reasons for disposing of a subsidiary. Either, the company can see no potential for a business and it wants to get rid of it as soon as possible. Alternatively, the company may view the business as having good long term profit potential and so be inclined to keep it but it is worth more to someone else. So they could sell it for a higher price than they value it at.

Reasons why there could be no potential include: the business or industry is in long term decline e.g. products are out of date, it doesn't fit in with other parts of the company e.g. a lack of synergy or management expertise, internal political issues such as turf wars or integrating different cultures.

In order to assess the prospects for each subsidiary the company will need to assess future profit potential and the impact on earnings (current and future) for its shareholders. A form of IRR calculation could be used. It is likely that this will be expressed in terms of say a return on capital for each subsidiary or earnings per share or EBITDA.

It is likely that the company will have targets that it uses to assess its existing businesses. Each subsidiary will have to be measured against these targets. Only those that have the potential to meet the targets will be retained.

The targets may need to be adjusted to reflect each subsidiary e.g. if the business is materially different to existing businesses.

Clearly the targets will need to take into account the cost of servicing the debt issued to fund the purchase. If the purchase is large relative to the existing business or costs are out of line with "normal" costs of capital, existing targets may be amended.

It is likely that actions will be needed to improve the prospects of many of the subsidiaries as they not be performing anywhere near their potential.

Hence many subsidiaries may fall short of their targets now but could meet them once remedial measures are taken.

Detailed business plans will need to be prepared for each subsidiary. Future costs, revenues and profits can then be estimated.

At this stage, subsidiaries that are unlikely ever to satisfy targets can be identified and prepared for sale. Ditto those subsidiaries that are clearly worth retaining.

For the more borderline cases, the targets would be reassessed once the business plan has had time to take effect as the actual effects may not be as envisaged — hence the one-year window for final decision making.

In assessing the subsidiaries, allowance needs to be made for the cost of any capital that will need to be invested under the business plan together with any existing debt in the subsidiary.

Accounting or tax treatment may play a significant part in the process. Ultimately, the company is concerned about net earnings per share. Subsidiaries may have revenues (or costs) e.g. from overseas that are attractive (or not) under the regime the company operates under.

The company can then put a value on each subsidiary based on future net earnings. More likely this will be in the form of a range of values under various scenarios.

It can then approach possible purchasers of the subsidiaries that are worth keeping (those that aren't will be sold anyway unless the price available is laughably low). It is probable that potential purchasers were lined up prior to the takeover and preliminary negotiations started.

The company can then consider whether it would be better to sell or retain based on offers received. It would take into account any transaction costs on such sales. Accounting and tax considerations would also apply here.

Many candidates appeared to be intimidated by the apparent complexity and unusual scenario in this question. Better candidates related their comments to the specific issues set out in the question and structured their answers well.

7

(i) For each employee to be covered:

- Nationality
- Date of birth
- Country of residence i.e. normal work location
- Gender
- Specific occupation
- Destinations the employee travels to on business or pleasure
- Average number of trips per year and average length of stay
- Do employees regularly travel together on trips?
- Have there been any prior incidents including threats involving the employee?
- Is the employee privately insured?
- Medical history/conditions
- Are any methods of personal security and protection adopted?
- Does the employee have a non-minor criminal conviction?
- Does the employee have a high profile due to their social or political activity or occupation?
- Details of partners/children travelling/based with the employee

In addition some information will be needed for the company as a whole:

- Nature of business
- Profile of the company e.g. large , well-known, perceived as “rich”
- General security measures, policies or procedures in place
- Other relevant insurance provided for employees
- Sum insured and/or excess requested for each event (may vary by employee)

- Is the company aware of any specific threats to or prior incidents involving it or specific employees?
- Any particularly valuable property eg specialist equipment
- Or any other factors that could increase the chance of a claim?

(ii)

a. There is the conflict of interest between the insurance company and the employer.

   - The insurer will seek to minimise the cost of claims. The employer will want re-assurance that claims will be paid in full.
   - For example, the insurer may want to impose maximum payouts or excesses.
   - And the employer may want a quick (but costly) settlement to minimise disruption.
   - This is especially relevant since much of any "claim" would be initially paid by the employer and then reimbursed by the insurer.

   There is the similar conflict between the insurance company and the employee.

   - In that in trying to reduce the level of the claim (e.g. no ransom is paid), the well-being of the employee is jeopardised. The insurer may prefer a long period of captivity.
   - There could be dispute over the interpretations of stress and trauma. The employee may expect compensation to be paid but the insurer may disagree.

   There is the conflict between the employer and the employee.

   - It may be in the interests of the employer to keep the claims low with regard to future premiums eg profit shares for good experience.
   - This is especially the case if the policy wording is unclear or there are a lot of exclusions. For example, any negligence on the part of the employer or employee. That is, is the employer actually covered?
   - Some of the benefits may be optional (see (iii)). Those that are attractive to the employee may be deemed as too costly by the employer.

   There is also the issue of moral hazard particularly relating to the employer v insurance company or employee. The employer may expect/encourage the employee to take more risks because insurance exists.

b. Arranging the policy benefits so that a speedy resolution and payment of ransom (within reason) results in a lower claim than prolonged captivity, negotiation and expense with possible injury, death or trauma.

Clear policy wording and precise description of benefits including when they would be payable would clarify the situation. There is hence no ambiguity or confusion.

Co-operation between the insurer and the employer at all stages e.g. deciding whether to pay a ransom and how much to pay, will prevent arguments later on.

To this extent, having agreed procedures or even arbitration as part of the policy would help. For example the insurer may insist that the employer follows the advice of law enforcement agencies or politicians. If the employer went against such advice, any claim could be invalid.

(iii) The insurer could provide or arrange for the provision of a range of services to the employer (or directly to employees).

The aim would be to reduce the chance of an incident or if an incident did occur, to control the level of a claim.

In addition, assistance could be given to help with procedures to make things run as smoothly as possible with a reduction in anxiety and unnecessary complications.

Specific features of this assistance could include:

- The provision of regular kidnap and ransom reports for various countries or regions so that clients are aware of the conditions they are exposing themselves to.
- The provision of personal security advice, and training.
- This could include booklets, courses, presentations videos, self-defence, recruiting security staff or purchasing equipment.
- Providing basic information on how to respond should an incident occur e.g. to reduce the risk of injury or increase the chances of escape.
- The provision of a help-line or text or e-mail alerts so that clients have direct and immediate access to up to date information, which can help with their personal security and avoidance of risk.
- The provision of corporate crisis management guidelines to assist the company in dealing effectively with a range of crisis. In particular how to respond quickly, liaise with relevant authorities and set up teams to manage the situation.

- The provision of practical advice to employees to help them manage in a crisis. For example how to behave towards kidnappers or cope with threats.

Similar advice could be given to families in respect of how they should respond. For example providing access to services of psychologists to provide support.

The insurer could pay for the client to use an independent consultant to provide assistance and advice. Such an expert could help with negotiation, liaising with police etc and generally help to obtain release quickly and at minimal cost.

The consultant could train staff of the employer for example in how to negotiate or with public relations. This could include access to interpreters to deal with language barriers.

The consultant may be able to co-ordinate rescue attempts or assistance in tracking down or contacting kidnappers, and the selection and training of a person designated to deliver any ransom payment, including advice on the form of the ransom and how, where and when it should be paid.

A non-standard situation, but we had plenty of good answers that showed imagination and a practical appreciation. In part (ii), too many looked at professional conflict issues which are not the issue here. Better candidates gave broad answers rather than going into extensive details on one or two points.

END OF EXAMINERS REPORT