

EXAMINATION

April 2005

Subject CA1 — Core Applications Concepts

**Paper 2
(Liabilities and Asset Liability Management)**

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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The division of the syllabus and core reading for CA1 into two parts for the 2005 and 2006 examinations in order to cope with the transition arrangements between the old and new examination strategies leads to an unbalanced split in the examination papers. The paper 2 syllabus and reading is considerably longer and less straightforward than that for paper 1. As expected the standard of candidates' solutions was less good in this paper than in paper 1.

As the title of the course suggests, this subject examines applications of the core techniques and considers broad actuarial concepts in practical situations. 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. These features are particularly tested in Paper 2.

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) For both types, the arrangement determines a proportion of each and every risk to be covered by the reinsurer. The proportion, or a rule for calculating it, is determined at the inception of each risk.

There will normally be an obligatory treaty in place. This requires the writer to reinsure and the reinsurer to accept all the risks taken on at standard rates.

The experience, apart from differences in expenses and commission of the reinsured and the reinsurer, will be similar.

For Quota Share reinsurance a fixed percentage of each and every risk is reinsured.

For Surplus reinsurance the reinsured establishes a retention limit, which is specified in the treaty, and the reinsured retains all risk up to the retention limit.

The reinsurer takes all risk above the retention limit, up to its own maximum level of cover, also defined in the treaty. Risks in excess of the reinsurers maximum level of cover fall back on the reinsured, but would normally be reinsured elsewhere by a "second surplus" treaty.

If a claim is less than the full sum insured, it is settled in proportion to the share of the sum insured covered by the reinsured and reinsurer.

- (ii) Quota share. Assume 35% of the risk is retained.

Then for sum insured £100,000, direct writer pays £35,000, reinsurer £65,000.

If the claim is only £60,000, direct writer pays £21,000, reinsurer £39,000

Surplus. Assume retention limit £100,000 and reinsurer's maximum cover £400,000

For sum insured £65,000, reinsured pays £65,000, reinsurer pays nothing.

For sum insured £120,000 reinsured pays £100,000, reinsurer pays £20,000

If the claim is only £60,000, reinsured pays £50,000, reinsurer pays £10,000

For sum insured £550,000 reinsured pays £150,000, reinsurer pays £400,000

Most candidates answered well on Quota Share, but relatively few understood Surplus reinsurance, particularly failing to mention the concept of a retention limit, which is fundamental to this type of cover. Many candidates discussed the advantages of proportional reinsurance as opposed to describing how it operates.

- 2** (i) The main reasons for analysing the surplus or deficit arising between successive valuations of a benefit scheme are:

To identify the most significant sources of profit/loss and so review the risk of operating the scheme.

To review the assessed cost of new benefit accrual.

To check both the valuation assumptions and the method.

As an independent check on the valuation results and data.

To help formulate decisions about how to deal with any surplus or deficits that has arisen.

To assess the performance of trustees and managers.

To provide detailed information for disclosure to shareholders of the sponsoring employer.

To monitor trends in experience to assist in corrective action (actuarial control cycle).

A requirement of legislation or professional guidance.

- (ii) The aim is to establish a model that compares the actual experience since the last valuation with what was expected if all assumptions had been borne out.

The starting point is the results of the last valuation, therefore need full details of the assumptions made last time.

Obtain data on what has happened since then

... cashflows — contributions/premiums, benefits paid, expenses
... investment returns — capital movements and investment income
... membership movements
... salary/benefit increases

Consider changes in benefits provided by scheme, contribution rates, etc.

Compare actual against expected for each item separately.

Consider whether the experience has been typical. Is there sufficient data for it to be statistically significant?

Analyse the effect of any change of basis.

This question was generally well answered, although many candidates' answers related to insurance companies instead of benefit schemes. In part (ii), several candidates wasted effort by discussing how to value assets and liabilities as opposed to how to analyse surplus and deficit. Other candidates seemed to confuse the model with a general asset / liability model and did not relate their solution to the particular question.

3 (i) For the applicant

The advantage is that there is no need to estimate the value at risk, and to keep it up to date with inflation. This would be difficult for a non-professional estimator to do.

The householder is sure that he is fully covered.

Individuals with overly valuable goods in a small house are likely to see a reduction in premium.

The disadvantages are for those with small households of one or two people living in a large property (perhaps because their children have left home). They may be over-insured and pay a higher premium.

For the company

The advantage is that there will be no need to assess the sum at risk to ensure that cover is adequate. This will reduce claims management expenses and will also limit potential adverse publicity if claims are reduced through under-insurance.

The company may find it easier to offer telephone or on-line applications, thereby reducing costs. This is because the applicant will not have to think about the sum insured required.

The company is introducing increased pooling of risks by averaging the sums insured for different property types. Whether this is an advantage or not depends on whether it gets the premiums right.

Many properties have rooms that could equally be used as bedrooms or for other purposes. Classification could be difficult if this is left to the applicant. This could result in identical properties being charged different premiums.

This approach may lead to anti-selection because individuals with high value goods (e.g. much jewellery) living in a smaller property would be attracted to the new contract. Conversely those with few possessions in a large property would go elsewhere for insurance.

This might lead to a change in the mix of risk taken on, which is not present in the portfolio used to set the premium rates.

On the new approach, the company may not have adequate data to set the premium rates.

If the premiums are wrong, losses may result.

Unlimited cover may create moral hazard if customers exaggerate claims.

- (ii) To mitigate the company's risks it could:

Impose a maximum single article limit or a limit of the total of jewellery and other valuables. Additional premiums would be required for any excess risks. This would limit the risk of high value items in a small property.

Make the rating factor the total number of rooms (excluding kitchens and bathrooms). This might still leave distortions where houses have had two rooms converted into one.

Allow for a change in the mix of business in setting the new premium rates, and obtain maximum amount of data on similar policies.

Raise excess levels.

In part (i), most candidates picked up the main points relating to anti-selection and the reduction in costs and time at the application stage. Better candidates commented on the practical issues of using a bedroom classification. Part (ii) was less well answered, with few candidates doing more than listing a couple of suggested controls.

- 4** (i) The model design will need to consider and allow for:

Any statutory requirements relating to the valuation of both assets and liabilities.

The likelihood of catastrophes and accumulations of risk, and the vulnerability of capital to major shocks such as these.

The effects of non-proportional reinsurance coverages.

The spread of different risk groups within the portfolio.

Insurer's experience of writing different classes of business.

Liquidity risk — will the assets be able to be realised to pay unexpected claims.

The current position in the insurance cycle.

The expected level of profitability and level of investment return generated.

The level of free assets.

Volume of new business.

Levels of potential cashflows - premiums, claims, investment income, expenses, tax.

- (ii) The company could test stresses using variations in assumptions and a deterministic model. It is easier to test effects of particular defined scenarios using a deterministic model.

A stochastic model is more complex, and harder to get right and explain — greater model risk.

Stochastic models are harder to parameterise — greater parameter risk..

For some products, asset risk is not important enough to justify the effort/cost of a detailed model. However there are well defined and well tested stochastic asset models available.

Stochastic models are more objective in incorporating allowance for volatility in asset values and uncertainty in claims experience than deterministic.

Stochastic models may take into account correlations between and within assets and liabilities.

Stochastic modelling allows construction of probability distribution for outcomes and assessment of a risk of ruin, or alternatively the capital required to avoid ruin at all but a small number of outcomes.

- (iii) Statutory authorities — to protect policyholders.

Company management — duty to company / shareholders / policyholders.

Analysts / rating agencies — provide accurate information to investors.

Insurance brokers / IFAs — to place business with solvent companies.

Shareholders/bondholders — to monitor their investments.

Policyholders — to check the solvency of their insurers.

Competitors — to try to discover competitively useful facts.

Potential purchasers of the company — to assess its value.

Employees — to assess security of jobs/pensions.

Creditors – to control their business risks

Auditors – to decide if going concern basis appropriate.

Better candidates scored well on part (i) by describing features of the business relevant to solvency (i.e. most features); some candidates discussed some particular features in unnecessary depth. In part (ii) most candidates commented on the relative complexity of stochastic methods but the weaker candidates did not relate their answers to the issue of solvency, for example the desirability of assessing extreme scenarios or outcomes. Part (iii) was well answered with candidates suggesting some inventive reasons for the interest of each party.

- 5** (i) The company will no longer incur the costs of obtaining the additional medical information.

The savings will give the opportunity for premiums to be reduced, or alternatively profits increased. The company would normally wish to reduce premiums if it can. This will make the contract more competitive, and thus should increase sales.

The underwriting process should be faster. This will be popular with prospective policyholders and with insurance intermediaries. It should lead to increased sales.

Reinsurers may wish to re-price reinsurance cover, or become more involved in the underwriting process for large cases. This might increase costs or introduce delays, offsetting the benefits above.

The underwriters will have to base decisions on more limited information and so more experienced underwriting staff may be needed, increasing staff costs and reducing the expense savings.

The company could increase the number and depth of questions on the application form. This may be a deterrent to prospective policyholders, and offset the benefit of the faster underwriting process.

With less information, it may be necessary to decline more lives. This may lead to complaints, or intermediaries not recommending the company.

The risk of underwriting incorrectly will be increased. This may cause mortality experience to worsen. Alternatively unnecessarily harsh terms might be imposed, to ensure experience is no worse. This may have the same consequences as increased declinations.

There is a risk of anti-selection if the company attracts lives where the additional information from a medical report would cause other companies to impose special terms.

There is a risk of moral hazard if customers believe they can give incorrect information and not be found out by a medical exam.

(ii) The company would wish to investigate experience against assumptions in:

- mortality
- expenses
- new business volumes
- market share
- the proportion of cases where special terms were offered
- the rate of acceptance of special terms
- the proportion of cases declined
- intermediaries perception of the advantages/disadvantages of the new arrangements
- the number of, and volume of business from, supporting intermediaries.

With only two years data, any changes in mortality experience are very unlikely to be statistically significant unless the company is very large, and most mortality tables have a select period of at least two years.

Nevertheless the mortality rate within the first and second years of the policy could be calculated both before and after the change.

The number of deaths and the exposed to risk would be counted, taking care that they match. If there is sufficient data to generate credible results, analysis by cause of death would be a useful guide to the underwriters.

Analysis by age and sex might be possible, but for deaths at short duration this would be less useful than the cause of death analysis.

Underwriting expenses should emerge from the company's expense analysis.

Before the change these would include costs paid for medical reports and examinations.

The costs of the underwriting department would be determined. The direct costs would be grossed up for management costs and other overheads. The

costs could be expressed both as a charge per new policy written and as a charge per case proposed.

For comparison with the costs two years ago, it is important to inflation adjust the results.

It will be important to look at new business both in terms of the number of cases and the average size.

Changes in the way industry statistics are collected for market share results will have to be allowed for.

The company could also investigate whether any competitors have adopted similar underwriting approaches.

Most of the other statistics are a simple analysis of the data from the company's systems. Consistency of approach is important.

A questionnaire could be prepared for intermediaries that have supported the company both before and after the change, and for those intermediaries who either started or stopped supporting the company as a result of the change.

This question was generally poorly answered, with few candidates writing sufficient points to score highly. Many candidates seemed to miss the obvious points on this question - for example, the fact that the company would save on the costs of obtaining the additional information. Disappointingly, few candidates discussed in part (ii) how to investigate all the issues that they had raised in part (i), instead discussing analysis of experience in general and so missing out on many available marks.

6 (i) It would be useful for scheme members to receive:

Estimate of the benefit entitlement in detail
... accrued and projected at retirement
... what pension might the lump sum purchase
... including options (for purchasing dependants' benefits, increases, early/late retirement etc.)
... specifying any assumptions used in these estimates

Statement of any risks to the benefit entitlement
... what happens if the employer becomes insolvent
... and if the scheme does not have sufficient funds

Statement of how well-funded the scheme currently is
... and the implications if the scheme was wound up now

Confirmation of any contributions the employee has paid
... and how much he will have to pay in future
... and what the employer is contributing

Statement of the fund's investment strategy
... and recent investment performance
... net of expenses

Details of how the scheme is operated
... and how the employee can get more information

- (ii) All guarantees have a cost (otherwise why is one requested?)

Market annuity rates do vary, depending on bond yields, etc., and it is quite conceivable that they will fall sufficiently that the guarantee will bite.

Indeed, rates would be expected to fall over the medium term because of improvements in longevity.

Employees could choose whether to take the guarantee, so there is risk of anti-selection.

The expected cost of paying the pension may be less than insurers charge, as insurers will have a margin for profit/expenses. However insurers' margins also reflect the cost of putting up the risk capital.

If the company underwrites the pensions, it is bearing the risk of adverse future experience and should reflect this in its pricing. The company would also need to establish and cost admin systems for pension payroll.

Market rates now may be low because of selection by those with good life expectancy but the company would face the same issue.

Annuity rates would normally be dependent on sex, and possibly also state of health. Guaranteeing a flat rate involves taking on a business mix risk.

Does the company have the capacity to operate rates that differ by state of health, and would it be perceived as unfair if it did so?

If the company offers this, it should model the risks it would be running, building in possible longevity changes as well as financial conditions.

It will need to consider safeguards to restrict its commitment and/or exposure:
... review the "guarantee" rate periodically
... (making it clear up front how this would happen)
... and consider how to invest to contain the risks
... or whether to lay off the risks through hedging or insurance.

Consider the competitive position – what are other employers doing?

In part (i), candidates generally picked up points about the individual's benefit entitlement but missed many points about the plan in general – few listed sufficient points to have a chance of scoring very highly. Part (ii) was poorly answered, with only the better candidates

noting that guarantees might bite and that the company should model the likely costs of this risk. Very few candidates actually discussed the issues that affect the cost if the company offers this guarantee or discussed how to mitigate the risks.

7 (i) A ... Lump sum in advance when individual commences employment.

B ... Regular contributions throughout the period that the individual is employed.

C ... Lump sum at the time the individual retires.

D ... Pay-as-you-go as benefit payments are due.

Surplus/deficit does not arise under D.

Generally, surplus might be dealt with by reducing future contributions, but there is no scope for this under A, and only limited scope under B and C — surplus may arise after retirement.

An alternative is to take a refund of surplus.

Generally deficits are dealt with by the employer paying additional contributions. This may happen after the employer thinks he has finished paying, and a significant unexpected contribution requirement may create problems for the employer, especially if the individual is no longer employed.

Another option is to adjust benefits, but that defeats the objective.

There may be legislative constraints and/or tax implications.

(ii) Capital requirements can be considered in terms of economic capital or regulatory capital.

Regulatory capital will depend on what legislation applies (if any) and on what accounting rules apply.

In economic terms, the company is taking on an obligation which reduces its available capital; the obligation is the value of the benefits and expenses that will arise. There are a variety of ways to value this but it is important to allow for the uncertainty: the risk that the actual obligation exceeds the expected cost.

The company could aim to secure this with an insurance contract at retirement - consider the expected premium - or even look at the cost of securing the benefit now.

Even if it is not intended to secure the benefit with insurance, the cost of doing so is a good measure of the cost of the capital required to provide it.

The company needs to ascertain whether the obligation accrues immediately or over the course of the individual's career. The latter is preferable so that the capital cost can be met from profits over the period, which is the period that the company benefits from the individual's work.

Also consider the benefits payable if the individual dies or leaves before age 60.

There may be currency risk — consider if that could be hedged.

- (iii) Establish exactly the target benefits
... dependant's benefits, pension increases in payment
... is the target pension really a fixed amount at age 60, or indexed

Establish the contribution pattern
... regular level contributions or increasing with salary.
... how much is affordable

If he died, or retired early or late, how much would be required in the fund.

Does he intend to purchase an annuity at retirement with some or all of the fund.

Establish attitude to risk, given the uncertainty of outcomes. Are there particular risks to be avoided or that the individual is prepared to accept.
... does the individual prefer to aim high or low?
... is there scope to adjust contributions in response to changing circumstances?

Establish how he intends to invest his fund and whether that would change over the period to retirement.

Obtain information on his health and life expectancy.

Establish his tax position — on pension and contributions

- (iv) Remind the individual of the inputs he gav.

State that the answer will depend on actual experience so you need to make assumptions, and set out the key assumptions made.

Illustrate the variation by using a range of scenarios or stochastic analysis.

Point out that the uncertainty will be affected by his investment choice, and possible changes to tax, legislation, etc.

Suggest that there is regular review to see whether the contribution plan continues to meet his objectives.

In part (i) most candidates correctly listed the four timing approaches but only better candidates outlined all the methods of removing surpluses and deficits. Part (ii) was very poorly answered, with few candidates appreciating that making a benefit promise would affect the company's capital immediately (as opposed to its liquidity) and of those who did, few went on to discuss how to measure the effect.

Many candidates appeared under the false impression that the company was an insurance company, although this did at least lead them to comment on regulatory capital. In parts (iii) and (iv), several candidates appeared to be under time pressure whereas other candidates scored well on what was largely bookwork.