EXAMINATION

20 April 2010 (pm)

Subject CA1 — Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 An insurance company is considering expanding by buying smaller insurance companies and has enlisted the help of a consultant to identify possible targets.

Discuss the issues that the consultant needs to consider in order to do a professional job. [9]

2 An investor wishes to assess the value of an equity holding by calculating the value of the estimated future dividends payable.

(i) Set out, defining any terms and assumptions you use, the following models for carrying out this assessment:

(a) the general model;

(b) the simplified model assuming both the discount rate and dividend growth rate are constant.

[4]

The next annual dividend on this holding is due tomorrow and will be 100 cents.

(ii) (a) Calculate the value of the equity holding, using the simplified model in (i), and assuming dividend growth rate of 2% a year and discount rate of 5% a year.

(b) Calculate the effect on the value if dividend growth is 10% for each of the first two years, and then reverts to 2% a year. [2]

(iii) Explain how the calculated value of the equity holding could allow for uncertainty. [3]

[Total 9]

3 (i) State the three pillars used in many regulatory environments. [1]

(ii) Explain why a regulator may use a number of different thresholds for assessing the solvency of financial institutions. [3]

(iii) Discuss why economic capital can be used when assessing the solvency of financial institutions. [8]

[Total 12]

4 (i) Explain the term Value at Risk (VaR). [2]

(ii) Outline the limitations of VaR as a method of measuring risk. [4]

(iii) Define the Expected Shortfall as a measure of risk. [2]

(iv) (a) Outline two examples of low probability, high impact risks that exist for a small manufacturing company in terms of how they would affect its business.

(b) Suggest how these risks could be mitigated. [4]

[Total 12]

5 A defined benefit scheme is being discontinued.

(i) State the options available for the provision of benefit payments due after the scheme has been discontinued. [3]

The managers of the scheme have proposed that the scheme's benefits will be transferred to an insurance company in exchange for an upfront premium.

(ii) Discuss the main risks that the insurance company will be taking on. [5]

The managers have received quotes from a number of insurance companies.

(iii) Explain why the quotes from the insurance companies may differ. [6]

[Total 14]

6 An insurance company has been selling term assurance and annuities for over 25 years.

Discuss the features of the external environment that affect these two products, highlighting any significant differences. [16]

7 A charity that exists to promote the interest of elderly people has prepared a report on the cost of travel insurance. The findings are that people aged over 65 are charged, on average, 80% more than people under age 65 for similar travel insurance products. The charity argues that this is a clear case of age discrimination and profiteering by insurance companies. It is pressing the government to introduce legislation that will require insurers to charge the same amount for the same policy to all policyholders irrespective of age.

To support its case, the charity points out that the vast majority of claims under travel insurance policies are for events such as cancellations, delays, loss of luggage, theft of property or inadequate standards of service or accommodation. It argues that these issues are not dependent on the age of the policyholder and so elderly people should not be charged more.

The charity states that elderly people do not engage in high risk behaviour or dangerous activities such as skiing, whereas younger people's travel tends to involve more risk and hence they are more likely to claim.

A representative of the insurance industry has been asked by a prominent media organisation to make a statement and answer questions in response to the report.

(i) Outline the introductory remarks that the representative could make to explain the influences on the travel insurance market and the insurance industry's approach to elderly travellers. [5]

(ii) Discuss the specific points the representative should make when analysing the charity's report and justifying current industry practice. [9]

The marketing director of a large insurance company believes that the charity's report presents an opportunity. The director argues that by introducing a travel insurance policy where premiums are the same for all ages, the company's market share can be increased significantly.

(iii) Outline the risks to the insurance company inherent in following such a strategy. [7]

(iv) Describe how the insurance company could structure and market a travel insurance product that does not involve higher premiums for elderly people but could control the risks in (iii). [7]

[Total 28]

END OF PAPER

EXAMINERS' REPORT

April 2010 Examinations

Subject CA1 — Actuarial Risk Management

Paper Two

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.

R D Muckart
Chairman of the Board of Examiners

July 2010

General comments

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.

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 Being a Professional

Need to be reliable – in particular delivering the work that meets the clients requirements in terms of detail, quality and timeliness
What level of detail/information will the large insurance company require
Does the timescales look reasonable – when does the large company want the information
Need to also recognise other stakeholders and what is in the public interest

Know your client
Need to have sufficient background about the insurance company e.g. what products does it sell, what is it looking to buy, what expertise does it have

Conflicts of Interest
Need to consider whether they advise any of the possible targets
It is important that there are different advisors who are independent particularly if they are analysing the same data
Consider whether "Chinese walls" or other procedures could reduce the possible conflicts
Need to ensure that any price sensitive information is correctly protected

The Task
Need to consider how the possible targets will be presented back to the insurance company (i.e. formal presentation of possible targets in a report)
What resources are required to assess the targets

What is the problem
The consultant needs to understand the scope of the task:
E.g. Need to be clear on how many targets, what the max purchase price and hence the possible targets – i.e. what is the definition of small and is there particular types of companies (e.g. just annuity providers or wider companies)

Answering the Questions
The consultant needs to have access to all the relevant factors for possible targets that it may consider
Where sufficient facts on the possible targets is not available – will need to mention with the large company when giving recommendations
Also needs to understand who will review the work – will the larger company's strategy team review

Assumptions
Any assumptions made on the possible targets need to be determined and explained to the client (e.g. growth expectations)

Methodology
The methodology in valuing the company and determining whether they are good value will need to be determined

Communication of the answers
Client needs to understand the recommendations, hence the results need to be clear
Assumptions, areas of risk and uncertainty should also be clearly presented

Need to consider any professional guidance and regulation
Need to ensure that they are answering questions within their expertise
And seek guidance from others if required
Ensure that adequate documentation is kept on the work being done

2 (i) (a) Formula: $V = \sum_{t=1}^{\infty} D_t v(t)$

Where D_t is dividend payment at time and $v(t)$ is discount factor at time t

(b) Simplified formula: $D_0 \times (1 + g) / (i - g)$

Assuming annual dividend payments with D_0 having been paid immediately before the valuation, and an infinite term for future payments, where i and g are discount rate and growth rate respectively, and ignoring tax

(ii) (a) $100 \times (1 + 1.02/0.03) = 100 \times 35 = 3500$

(b) From year 2 onwards, the valuation factor of 35 can be re-used
So, $100 \times [1 + 1.1/1.05 + (1.1/1.05)^2 \times 35] = 4046$

(iii) Can use best estimate of cash flows, and then discount at a rate that allows appropriately for the riskiness, which needs some assessment of the riskiness, the allowance would then be added on to a risk-free government bond yield

Or can model the experience, perhaps stochastically, assigning probabilities to the key factors that influence the cashflows, so to give a probability range for the assessed value

3 (i) The three pillars are:

- Quantification of risk exposures and capital requirement
- A supervisory regime
- Disclosure requirements

(ii) A solvency regime is about providing protection to customers.

By specifying more than one basis for capital requirements can allow a ladder of intervention to be set up

For example in life insurance:

- A solvency capital requirement – the target level of capital below which companies may need to discuss remedies with their regulator
- A minimum capital requirement – the threshold at which companies will no longer be permitted to trade

(iii) A provider of financial benefits will need to hold reserves or provisions for liabilities that have accrued but which have not yet been paid

Economic capital is the amount of capital that a provider determines is appropriate to hold given its assets, its liabilities and its business objectives

Typically it will be determined based upon the risk profile of the individual assets and liabilities in its portfolio, the correlation of the risk and the desired level of overall credit deterioration that the provider wishes to be able to withstand.

The advantage of using economic capital is that it should achieve an adequacy of provisions that is consistent with the regulatory regime targets, avoiding risk from firms holding inadequate provisions without introducing inefficiencies from unduly higher provisions

Using economic capital rather than a standardised approach means that firms hold capital appropriate to the inherent risks. This might promote confidence in the markets if analysts believe that companies are holding suitable capital for the risks they hold. Economic capital is also a measure that can be explained to management to ensure better risk management.

This avoids the risk that firms "game" the regulatory systems, so that they hold provisions less than the target confidence level of the regulator creating a risk for the financial system and reducing the security of customers' benefits below target levels.

Economic capital might be higher than regulatory capital and hence the company may be obliged to hold the higher of the 2

Overseas companies may have different regimes and hence using economic capital may mean it is on a consistent basis

Within a regulatory regime a regulator will usually set a standardised methodology and at least the basis for setting assumptions for established adequate provisions.

A standardised approach is simpler for the regulator to administer, however, it is difficult to ensure that it results in an appropriate level of provisions for all current and future financial products and all combinations of business mix.

There will be areas where the standardised approach results in undue strength of provisions or in inadequate provisions. Neither of these outcomes is desirable as the regulator will want to avoid company failures and undue strength result in higher cost of such financial products.

4 (i) VaR generalises the likelihood of underperforming by providing a statistical measure of downside risk. It assesses the potential losses on a portfolio over a given future time period with a given confidence level. It can be measured either in absolute terms or relative to a benchmark

(ii) It is based on assumptions that may not be immediately apparent

In particular, it is frequently calculated assuming a normal distribution of returns. If the distribution of returns is "fat tailed" or skewed, tracking error may be misleading

It doesn't consider the outcomes within the tail

Unfortunately, portfolios exposed to credit risk, systematic bias or derivatives may exhibit non-normal distributions.

The usefulness of VaR in these situations depends on modelling skewed or fat-tailed distributions of returns either in the form of statistical distributions or via Monte Carlo simulations

However the further one gets out into the "tails" of the distributions, the more lacking the data and hence the more arbitrary the choice of the underlying probability becomes

(iii) Expected shortfall is defined to be the expected loss in a portfolio's value given that the loss is occurring at or below the pth percentile

It gives the expected value of a portfolio in the worst p% of cases under consideration

It evaluates the value of the portfolio prudently, concentrating on the possible less profitable outcomes

(iv) (a)

- Being a small company it is likely that all the manufacturing will be done in one place and hence there is a risk of total loss of business premises
- Total Machinery failure could affect the manufacturing of the products and hence cause issues with delivery to customers

(b)

- This could be mitigated by diversifying the risk by having two or more premises
- Or could be insured by catastrophe insurance
- Could be mitigated by having a number of machines
- Or insurance/indemnity cover could be purchased such that if something goes wrong then they will have replacement machines or payment paid to cover impact

5 (i)

- Continuation of the scheme without any further accrual of benefits
- Transfer of the liabilities to another scheme with the same sponsor
- Transfer of the funds to the beneficiary to extinguish the liability
- Transfer of the funds to a DC arrangement to invest and provide a benefit
- Transfer all of the liabilities to another scheme/insurance company
- Transfer part of the liabilities to another scheme/insurance company

(ii)

- The main risks are around the risks of future experience being different to the assumptions used in coming up with the premium to be charged

<u>Longevity</u>

- If the members of the scheme live longer than expected then the insurance company will need pay out for longer than expected
- This may have occurred because of medical advances

<u>Investment</u>

- If the investments that the insurance company use produce lower than expected then they may not be able to pay the expected benefits
- This may occur if they have invested in corporate bond investments and these have defaulted

<u>Inflation/index linked</u>

- If the benefits are linked to inflation and this is higher than expected then this will mean the benefits to be paid out will be higher than expected
- This is particularly important if they have been mismatched in terms of the assets bought
- Salary related indices may also be used and this also could be a problem if assets cannot be purchased to match these
- The expenses of running the scheme is more than expected

- If the original data was poor then there may be higher benefits than allowed for in the premium, for example more male members that were married and hence will be paying out for longer. The insurance company may also not understand the benefits they are taking on
- At risk if the legislation/reserving rules change
- The costs of the guarantees or options may be mispriced

(iii)

- The assumptions of the insurance company with regards to longevity/ investment/inflation may differ
- One company may take into account the past experience of the mortality of the scheme and/or taken into account the occupation of the scheme members
- The views on future inflation may differ
- The profit criteria of the various companies may differ
- The risk attitude of the companies may differ

- The capital assumptions may also differ – this may affect any deferred members
- The expenses of the policy may differ
- The investment strategy of the companies may also differ – meaning that the investment assumptions backing the annuities may be higher/lower, for example one company may be investing entirely in low risk corporate bonds whereas another is investing in higher risk bonds, or one may allow investments into overseas which may be higher yielding
- Any items where there needs to be interpretation on the data may mean that insurance companies have taken different views (e.g. marital status) affecting the differing quotes
- There may be different assumption regarding future marital status e.g. one company may take the extreme view that all Single members will remain single throughout the lifetime of the annuity whereas another company may assume they all marry (hence having longer expected duration)
- Synergies with existing business (e.g. Individual annuity business) or economies of scale
- The companies may have interpreted the benefit payments differently
- The models used may differ between companies

6

- **Regulations** may influence the type of financial product most suited to a consumers needs when there are a number of otherwise acceptable products
- There may be restrictions on rating factors (e.g. differences between male/female rates offered)
- Annuities may be compulsory in the country
- There may be restrictions on how the sales process works for either product

- There may be **state benefits** available – e.g. there may be a state pension that supplements any annuity – this may mean that people are not incentivised to invest in pension funds for annuities (hence lower pot sizes)
- There may be state payments to dependants on death – again meaning that lower term assurance business may be required

- The **tax** treatment of benefits/premiums can also have an impact on the products
- E.g. if individuals can take cash lump sums out of the pension fund then the size for annuities will be lower
- Also if payments on death are subject to tax this will affect the sales of term business
- The tax treatment on the profits from either of these products also needs to be considered

- The way that benefits need to be reported in **company accounts** may influence the design of the products
- E.g. the different accounting requirements for setting the provisions for the two different types of contract

- The **capital requirements** of the two products will have an impact the pricing

- Any guarantees (in particular five year guarantees for annuity products) may require more capital/solvency margins
- Internationally, the Basel Committee influences the capital requirements
- In corporate finance, risk management requirements are concerned with the measuring and monitoring and controlling of the risk on a firms balance sheet
- Will be particularly interested in the investments backing the annuity business with Market and Credit risks need to be monitored

- Profitability in the 2 insurance classes tends to go in **cycles**, which are driven by market forces of supply and demand
- If the term assurance or annuity products are very profitable then it is likely new insurers may enter the market – reducing premiums and hence lead to reduced profits
- Inability to make profits in either of the products could lead to loss of business, or a reduced solvency position, requiring additional capital support or other remedial action (e.g. stop selling one of the 2 products)

- Changing **culture and social** trends could have a major impact for the products
- E.g. If there is increased taxes on smoking and hence a reduced amount of people smoking then this will affect annuities by increasing longevity (hence potential losses and/or reduced payments for new business)
- Or for term assurance the government abolished free health care then this could mean more people died as they could not afford the healthcare this will mean higher payouts, and expected higher premiums for new business

- **Demographic changes** to a population can have a major impact on the life insurance company (e.g. rising life expectancy)
- Rising life expectancy will mean that the annuities in payment will last longer than expected and therefore will cause losses for this part of the business
- For new business the annuity payments could be reduced but will be dependent on the competitive position of the market
- For term assurance this will mean that the payouts will be lower than expected generating more profit than expected
- This may lead to a persistency risk where people lapse and re-enter at a lower premium

- **Environmental issues** will need to be considered in order to not hamper the selling of these 2 products

- **Lifestyle** considerations need to be considered particularly if ...
- Annuitants could take up more exercise in retirement and hence become healthier, this would impact the life expectancy and hence impact the annuity profits/losses
- Having got term assurance there could be a change to the perception of smoking and hence more smokers – increasing the mortality for the product and hence increased losses

- Need to consider the **international** market to see if product enhancements could be used in the two products

- The term assurance could be simplified so that it could be sold easily over the internet, taking advantage of the **technological changes**
- Other technological changes could speed up (and improve) the process of underwriting for both products

- The **state** of the economy (is it in recession) will have an impact on both products
- There may be higher lapses for the terms assurance as people look at their outgoings
- The demand for annuities will change depending on individual's economic positions (e.g. may want to work longer if they retain job – less early retirees)

7 (i) It will be important to seize the agenda when making comments. The representative will want to make sure that a relatively small number of important points are got over clearly and frequently. They will want to avoid being distracted away into areas where their case is weaker or falling into traps

In particular, the representative must adopt a simple but straightforward approach so that there is little chance of misinterpretation or raising more questions than are answered

A starting point could be to say that elderly travellers are a significant and growing market for insurance companies. Hence it is not in the industry's interest to alienate such consumers by treating them unfairly. The industry is constantly seeking out ways to keep costs reasonable and is committed to working with other bodies to provide consumers with products they want.

Furthermore, the insurance industry is tightly regulated. Hence it will be difficult to discriminate or profiteer in the way suggested since these are issues the authorities focus on. If available, the representative could point to regulatory reports etc that endorse industry practice.

In addition, the market for travel insurance is very competitive. If companies were making excessive profits (generally or from certain sectors) then new entrants would come in and force prices down. For example, there is nothing to stop the charity setting up its own insurer in an attempt to undercut industry prices. It may well be that there are specialist insurers targeting the elderly and their premiums are similar to the market average.

The representative will have to acknowledge the core point that on average premiums are higher for older people. But they will want to question the implications made by the charity and explain the reasons.

Broadly speaking, insurance companies want to keep policies simple. It is in everyone's interests for there to be the minimum number of different rates as is possible. To this end, it is likely that most companies charge a flat rate premium for those aged say 18 – 64. So yes, many risks are not age dependent and the industry reflects that in premium rates.

(ii) Generally, the charity is correct in terms of the nature of claims. However, this isn't really the point since it is the amount of a claim that affects costs most.

The highest claims arise from medical treatment or illness e.g. costs of repatriation.

It is unfortunately the case that elderly people are more likely to be taken ill whilst travelling (data supports this). Hence for the elderly, a greater proportion of claims (even if small in absolute terms) are for expensive health reasons. If the average cost of claims is higher, then charging purely on risk means average premiums must be higher.

The charity implicitly recognises this argument since they claim that young travellers should pay more for higher risk. They can't have it both ways. On the one hand they say that risks are not age dependent but on the other, they say that the elderly are lower risk in certain circumstances.

In fact, extra premiums (above the standard rate) would be payable for people engaging in dangerous activities whilst away. Or alternatively, claims arising from such activities would be excluded. In addition, if the claim arose when the insured was drunk or under the influence of other substances, it is likely that nothing would be payable – so negating the charity's points.

The points about the nature of the trips taken by the elderly may be true but, they have little to do with risk attaching to general health matters. If you are in relatively poorer health the destination is irrelevant.

Other risks may well be higher for elderly people The representative whilst conceding the main conclusion will want to contest the details. Basically, the charity will be spinning the data to support its agenda.

In particular, the 80% more figure needs clarification. How has this been arrived at? Is it by comparing quoted rates or by looking at a sample of policyholders?

Either way, it will be very difficult to find similar policyholders where the only difference is age (e.g. many policies are sold to families/couples so rates can't be compared to single elderly people). Furthermore, this is an average and actual rates could vary a lot over the elderly population. The very old could pay a lot more those say under 75 not much more. The distribution is likely to be heavily skewed.

It will be more sensible to look at what policyholders actually pay and not theoretical comparisons or unrepresentative samples.

In practice, elderly people undergo more underwriting than younger people (though everyone would have to disclose very serious conditions – so some younger people may pay a lot more than standard). The effect of this could be that many elderly people don't pay a lot more than standard if their health is good. In effect the findings are skewed by the relatively few elderly people

who would be charged considerably more due to significant problems e.g. a history of heart attacks or lung disease.

Furthermore, age isn't the only discriminating factor. Duration and destination also matter. In effect people don't take similar trips. If the elderly went on relatively short trips to safe areas, then the core rate would be lower than people who travelled longer and more exotically. So looking at it rate to rate may hide the fact that in practice, due to the nature of trips, the elderly don't in practice pay much more.

Part of the reason could be that the elderly use expensive sales channels e.g. the charity and don't shop around. They pay more for less hassle. So the high premiums relate more to the intermediary and not the insurer.

Given the above, it is unlikely that legislation will be practical (risk issues) and it is probably not necessary as the problem isn't as big as the charity claims.

(iii) Essentially, the risks are twofold. Selling a lot of unprofitable business and/or not selling much profitable business.

The common rate will presumably have to be somewhere between the standard rates for younger people and the (higher) average rate paid by the elderly. The position in the range will determine the nature of the risks.

The proposal seems to focus on expanding market share. Hence it would appear that new rates will be close to rates for younger people. If so, the risk is that many policies will be sold to elderly people where the premiums received are less than the cost of claims – hence potentially large losses.

If the rates charged to younger people were to rise, (even marginally) then given the competitive nature of the market sales to this sector would fall. That is, there would be a fall in the potentially profitable business that would be needed to support losses on elderly policyholders.

If the new rates were closer to the current elderly rates (to mitigate the problems above), then we would expect to lose less on policies sold to the elderly – but business volumes would not increase much. However, there would be a large fall in business to younger people.

There is the danger that any younger people that were still covered would be high risk. That is those that couldn't get cheaper cover elsewhere. We would have a smaller group of younger policyholders to absorb these risks.

If, the increase in market share did arise, there is the risk of the systems being unable to cope, causing expense, new investment or customer dissatisfaction. It is also likely that underwriting standards would slip hence increasing risk.

On the other hand, if business volumes were in fact to fall, unit costs would rise.

The proposed change may cause problems with intermediaries e.g. if pressure were put on commissions. They may not even try to sell policies where premiums had risen or they may be wary about selling unprofitable business e.g. mis-selling claims.

The regulators may not like such loss making business and it may be hard to obtain re-insurance.

By introducing this type of policy, there is a credibility risk. The charity and others will be able to say that the old regime was discriminatory and lead to excess profits. If such policies are valid now, why weren't they in the past?

Likewise, there is the thin end of the wedge risk argument. This will lead to other pressure groups wanting uniform rates for say, the disabled, obese, smokers, men and women etc This will undermine the core principle of pricing by risk.

(iv) There are really two broad ways to do this. Firstly, the insurer could devise a policy where the risk didn't vary with age. Or secondly, they could arrange the benefits or marketing strategy so that there was some cross-subsidy but its impact was lessened or covered by other features.

The conclusion in (i) was that the main reason premiums vary by age (some young people also pay more) is down to the costs of medical claims.

The simplest way would therefore be to exclude medical cover in the same way winter sports or drunken behaviour cover is excluded.

Such policies may not be very marketable – though a cheap no frills policy may attract the relatively healthy (or those who think they are).

Could instead exclude existing conditions or specified treatments

To get round this, the insurance company may sell an associated medical cover policy as an optional add-on.

An alternative would be to have much stricter underwriting criteria. Any people who were not standard risks would be rejected. This would be expensive and again potentially unmarketable – but as above, cheaper rates may attract good quality business. Likewise, it could be sold as part of a two-tiered structure.

To mitigate the problems caused by the strict practices above, the insurer could retain medical cover but hove a low maximum payout. There would be some cross-subsidy but its impact may be small. This could be further expanded to other parts of the terms and conditions (e.g. excess)

There may be many countries where medical costs are low or where arrangements exist between governments so that much of the costs travellers incur are covered by states. The EU operates such a system. Hence policies

could be written that only cover travel to those areas. It may be necessary to have other exclusions if potentially large costs are not covered.

There may be causes of medical claims that affect people both in terms of incidence and cost similarly irrespective of age e.g. food poisoning. Hence policies could be designed that provide cover in these circumstances but not where costs vary by age. This will need careful wording and could be difficult to implement.

Travel insurance policies tend to be relatively cheap and are often purchased in conjunction with other products e.g. package holidays. They may not be price sensitive as many people just pay what is asked.

If the insurer can market policies through certain sales channels then they can charge high premiums that would possibly subsidise any losses arising on uniform premium policies. This does depend on the level of commissions payable to the intermediary.

It may be possible to introduce additional features or bonuses that look expensive but in fact aren't e.g. discounts on holidays (paid mainly be the suppler). This may enable the insurer to charge higher premiums for a niche product that covers the uniform rates problems.

Quite a wide variation on this question. Better candidates set out the significance of medical claims in (i), and gave a structured analysis of each of the charity's conclusions/assertions in (ii).

END OF EXAMINERS' REPORT

EXAMINATION

30 September 2010 (pm)

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1 An insurance company is considering introducing a health insurance policy, which will cover the cost of medical treatment. Premiums will be payable annually.

The policy will incorporate a guarantee such that premiums will be maintained at the existing rate if no claims have been made in the previous year.

Discuss the main considerations that will need to be taken into account when determining the appropriate premium to charge. You do not need to consider issues relating to expenses or investment returns and strategy. [8]

2 (i) Set out the main steps needed to identify and clarify the particular risks inherent in a project. [6]

A waste management company has decided to expand the range of its services. It is about to enter into contracts to transport and dispose of low-level radioactive waste.

The company is concerned about the financial consequences of accidents during transit or at the disposal site.

(ii) Explain why traditional insurance products may not be appropriate for mitigating these risks. [2]

(iii) Outline alternative approaches to mitigation that could be more appropriate. [2]

[Total 10]

3 In a developed economy, approximately 80% of the population own their own homes. The vast majority of house purchases are financed using mortgages with repayments typically being made over (or at the end of) 20 to 25 years.

A measure of house prices is known as the House Price Multiple (HPM), which is the ratio of the average house price compared to average earnings. Traditionally, the HPM has been around four. Over the last three years, the HPM has risen to around six.

Over the same period, interest rates on mortgages and the level of personal savings in the economy have been at historically low levels.

(i) Describe the risks to the economy that could arise as a result of this increase in the HPM. [7]

(ii) Explain the difficulties that the authorities could face if they try to reduce the HPM. [5]

[Total 12]

4 A large general insurance company writes a significant volume of personal insurance business. The company is considering introducing a new pet insurance policy.

(i) List the risks that the pet insurance policy is likely to cover. [3]

(ii) Discuss how to categorise and load for expenses when pricing a new general insurance product. [8]

It has been suggested that only marginal expenses are used for the purpose of pricing the new pet insurance policy.

(iii) Discuss this approach. [3]

[Total 14]

5 The annual gross redemption yield (GRY) on a conventional bond can be expressed as: GRY = risk free real yield + expected inflation + inflation risk premium + bond risk premium

(i) (a) State the equation that defines the yield gap traditionally used to compare the relative values of conventional government bonds and equities.

(b) Show how this equation can be expressed so as to give an indication of the market's view of the relative riskiness of equities compared to conventional bonds.

[3]

The GRY's on two corporate loan stocks with similar features (including currency, term and coupon) issued by companies A and B are 5.5% and 6.0% respectively.

(ii) Explain why these bonds might have different redemption yields. [4]

(iii) State the principles of investment. [2]

An insurance company writes a large volume of immediate annuity business. The company is considering using the GRY's on a notional portfolio of conventional bonds for the investment return assumptions it uses in its pricing basis for this line of business.

(iv) Describe how the notional portfolio could be chosen. [6]

(v) Discuss the potential problems resulting from using a notional portfolio for such pricing purposes. [4]

[Total 19]

6 An industrial company employs 500 people. It currently operates a defined benefits pension scheme for its employees.

The company has decided to close this scheme for future service. From a given date, existing employees (and any subsequent new employees) will be invited to join a new defined contribution pension scheme. They will contribute the same amount to the new scheme as they do currently (or would have done) to the existing scheme. The employer will also contribute to the new scheme. Benefits in respect of service prior to the closing date will continue to be paid from the existing scheme under the rules and terms and conditions currently in force.

(i) Describe the potential risks faced by the employer in providing a defined benefits scheme, which could have influenced the decision to close the current scheme. [8]

(ii) Discuss why the proposed changes might cause industrial relations problems. [7]

(iii) Set out the contents of the documentation that the company would be expected to provide to employees in relation to the new scheme. [5]

(iv) Outline the considerations that should be taken into account when preparing this documentation and any other ongoing communications with employees. [7]

The contributions payable into the new scheme are to be invested in the units of one of five managed funds provided by an insurance company. Each employee can choose which one of the five funds "their" contributions will be allocated to. In practice, most employees opt for the domestic equity fund.

Five years after the commencement of the new scheme, the unit price of the domestic equity fund has fallen by 25%.

Representatives of the employees have approached the employer's management to express their concerns. They argue that the fall in the unit price means that many employees are receiving or can expect to receive benefits that are considerably lower than those they were led to believe would be provided. To make up the shortfall, the representatives want the employer to make an additional one-off contribution and/or to increase future contributions payable in respect of all affected employees.

(v) Discuss the points the employer should make when responding to this request.

[10]
[Total 37]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2010 examinations

Subject CA1 — Actuarial Risk Management
Paper Two

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.

T J Birse
Chairman of the Board of Examiners

January 2010

General comments

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.

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 The main basic areas to consider before looking at the guarantee are:

Value of benefits (cost of claims) and contribution to profit (including a loading for contingencies)

The value of the benefit will depend on:

Age and sex
State of health, which will initially be assessed by a medical history declaration, doctor's report or medical examination or other information given at the proposal stage
Healthcare costs e.g. based on the precise form of benefits and terms and conditions.

In particular, it will be necessary to make an allowance for increases in such costs since payments could continue for some time.
It is likely these increases will be above the rate of general inflation.
This is due in part to the sophistication and complexities of tests and treatments increasing.

Without the guarantee, you would expect the premium to rise year on year, because of the above issues (older, inflation, etc).

Hence, intuitively the premium with a guarantee should be higher than a non-guarantee premium.
To allow for the guarantee, more sophisticated modelling extending over a longer time-frame will be needed.

A profit testing model will be used to calculate the premiums under different assumptions using either stochastic simulation or a set of deterministic scenarios, and allowing for the complexities introduced by the guarantee.

In particular, it will be necessary to model the probabilities of when claims will first arise and the value of the benefits payable (e.g. then current healthcare costs) from that date.

The inclusion of the guarantee may mean that higher provisions are needed and the costs of these extra provisions may need to be allowed for in the premium calculations.

A complication may be that the chances of a claim in the future may be less than originally assumed for policyholders who don't claim in the first few years. Or more generally, probabilities of a claim may change over time hence invalidating the original assumptions.

It is possible that the presence of the guarantee will affect the lives selecting the policy. Hence data derived from any existing policies or indeed from other sources may not be very helpful.

It could be argued that healthier lives will be attracted because, long term, the policy probably is better value for healthier people.

Clearly this will depend on the level of underwriting. If underwriting standards are lax, then unhealthy lives may be attracted if the premium is less than other companies would charge them.

An allowance for lapses may be necessary e.g. if rates in the market are falling. Lapses may be a source of profit unless a significant number of policyholders are not expected to claim.

The extra uncertainty, in particular over future healthcare costs or the availability of credible pricing data, will require higher contingency margins.

Depending on whether similar policies exist in the market, the company may be able to allow for a higher profit loading reflecting a unique product or niche market. Alternatively, the market may already be competitive so squeezing margins.

Given the uncertainties and likely changing market conditions, in practice, an open-ended guarantee is unlikely to be sensible. It may be necessary to have a limit on the time the guarantee will apply for and/or an age cap as the expected cost of treatment will increase rapidly at older ages

In any event, changes in regulations and tax will be outside the control of the company. Premium changes due to these factors may need to be excluded from the guarantee.

Overall candidates answered this question quite poorly, failing to go into much (if any) detail about the impact of the guarantee. Many went through a list of bookwork answers about what needs to be accounted for when setting premiums, without taking into consideration the question specifics.

2 (i) The main steps involved in the initial stages of a general risk analysis can be summarised as follows:

Make a high-level preliminary risk analysis to confirm that the project does not obviously have such a high risk profile that it is not worth analysing further.

Hold a brainstorming session of project experts and senior internal and external people who are used to thinking strategically about the long term.

The goal here would be to:

Identify project risks, both likely and unlikely and those positive and negative outcomes.

Consider the interdependency of these risks.

To help assess interdependency, a thorough categorisation of the risks identified may help.

Attempt a broad initial evaluation of each risk focusing on both frequency of occurrence and consequences if it does occur.

Produce initial outline mitigation options.

Attempt to identify further risks (e.g. those arising from earlier mitigations) by carrying out a desk top analysis.

In order to assist in the process, consider similar projects from the past either from the sponsor or other sources.

Carefully set out all the identified risks in a risk register, with cross references to other risks where there is interdependency.

(ii) The potential cost of such an accident could be huge.

It may take a long time to finally assess the actual liabilities with the likelihood of protracted legal wrangling and political interference.

An insurance company may be unwilling to cover such high impact low probability events – especially given the uncertainties over the level of benefits or data for pricing (probably a unique product).

If an insurer could be found, it is likely the premium charged would be prohibitively high.

Alternatively, there could be a very low maximum payout limit or strict exclusions e.g. concerning negligence of the insured.

(iii) Given that the source of the radioactive waste is likely to be a government or other public sector type body, the state may in effect act as an insurer or may give an indemnity against certain incidents.

This will be reflected in the terms of the contract (less money to the contractor) and may well involve the company having to comply with strict operating procedures.

Alternatively, the company could try to pass on liability to third parties i.e. only expose itself to low impact risks.

For example, they could lease vehicles, employ agency staff or use disposal sites owned by others. This may limit its liabilities.

This may have an impact on the profitability of the contracts and again care would be needed over the contracts involving other parties to make sure liability is actually transferred.

Other mitigation strategies could be valid if properly explained ie if the "best" options given above aren't possible.

For example:

Care over internal operating procedures e.g. only carry small amounts over short distances on safe routes at night say, to reduce risk of an accident occurring or

Quick and effective post incident responses to minimise impact of any incident eg links to emergency services own containment and clear up teams on standby close to routes used – ways of warning the public etc prepared. Note just saying planning isn't enough specifics of what will be done are needed.

Part (i) of this question was answered well, most candidates showed their knowledge of the bookwork on this topic. Many candidates did struggle to generate enough points in parts (ii) and (iii)

3 (i) Risks can arise:

An imbalance in the economy as more resources are devoted to sectors related to the domestic housing market e.g. the financial services sector, retailing, estate agencies and construction industries for example, lending to and consumption in other sectors is squeezed out.

Over-inflated asset values linked to high levels of personal and corporate debt leading to excessive consumption at the expense of saving.

There may also be problems pre the bubble bursting eg very hard for first time buyers to be able to enter the housing market or local hot spots where high prices makes the recruitment of low paid but essential workers difficult.

The core risk is of course that the bubble bursts and house prices fall.

Much of the price rises were probably due to psychology and confidence rather than underlying sustainable financial reasons. Such confidence is fickle and so the risk is that once prices start to fall they will fall quickly. This may be exacerbated because of the time lag before the supply of new homes can be adjusted downwards to reflect lower prices/profits.

The potential problems are very great since large numbers of people will be employed or exposed.

As the impact of the factors that caused the increase in house prices runs out of steam naturally then prices will fall. In normal circumstances this wouldn't be a major issue, just the routine rhythm of the market.

Many individuals will feel poorer due to the negative equity effect and so they will reduce consumption. Likewise consumption will fall as people will be unable to secure further loans (to fuel consumption) on the back of inflated house prices. Reduced consumption will slow growth so reducing consumption further – a vicious circle.

Labour mobility and hence economic growth will also suffer as many people will have mortgages in excess of the value of their houses ie negative equity issues and so can't sell.

Similar problems will arise if due to say the normal cyclical progress of the economy growth slows or interest rates rise.

Many people will simply not be able to service the debts on their mortgages (or other loans) – in trying they will cut back in other areas, so slowing growth as above.

Many people will default on their mortgages. Mortgage providers will see a rise in bad debts as re-possessed houses are worth less than the loans secured on them. This together with a fall in demand for mortgages causes losses and contraction in the financial services industry. This problem will be magnified if providers have borrowed money to lend it on.

These pressures on the providers of finance means that they will cut back lending to other sectors of the economy or try to make up for losses with higher charges elsewhere. This in turn, pushes the whole economy into recession so lowering house prices further etc. etc.

If these problems became very serious, government intervention may be needed with consequences for fiscal deficits, national debt and taxation/spending policies.

(ii) Essentially, the consensus may be that rising house prices are good for everyone. Many, many people will have a vested interest in growing the bubble hence measures to limit price rises will be very unpopular and politically difficult. The proposition of "some pain now to prevent greater pain later" will be a hard sell – especially if the economy is doing well.

The most obvious option would be to keep interest rates relatively high. But this is a very blunt tool. It would have implications for the wider economy in terms of reducing growth and employment. The value of the currency could rise, causing problems for exporters.

Taxing capital gains on housing, having high levels of inheritance tax or removing tax perks (eg on mortgage interest payments) would be an option. But this could be undesirable politically. Altering taxation policy has implications for other assets or income sources eg it could create other bubbles. Such consequences are hard to predict or manage.

Requirements on lenders to adopt stricter, legally enforceable practices could be introduced with the aim to stop lenders taking too much risk (not carrying out sufficient checks etc.). Such rules are hard to draw up tightly – providers are adept at finding and exploiting loopholes. Enforcement and sanctions are also issues – the whole process is an administrative burden and expensive to do.

Arguments would be made that such interference in the free market is wrong per se; e.g. restrictions on choice are viewed as bad. Such measures could be viewed as limiting labour or social mobility.

More subtle options such as implicitly or explicitly limiting the amount institutions can lend (overall or to the housing sector) are possibilities. But again there are usually ways round such rules. The effect may be to reduce lending to more productive sectors and maintain it to the (apparently) profitable housing linked sectors.

The government could try to boost the supply of housing but this will take a long time and be politically difficult (NIMBY issues).

Technically policies to boost earnings eg public sector pay awards could alter the ratio but this will only lead to inflationary cycle and further demand for houses – so it won't work.

A wide variation of scores on this question. Some candidates were surprisingly unfamiliar with a topical issue.

4 (i) The policy is likely to be for cats and dogs but could also be available for other pets.

It is likely to cover:

- Veterinary fees covering illness and injury or ongoing routine treatments
- Death benefit, possibly with a maximum age limit
- Holiday cancellation due to pet illness
- Boarding fees if owner in hospital
- Theft or missing benefit
- Advertising and reward for a missing pet
- Third party liability eg personal injury
- Accidental damage to property caused by pet

(ii) The expenses incurred can be divided between fixed and variable expenses.

Some expenses may remain relatively fixed in real terms.

Some expenses are broadly fixed but can jump at certain times and remain fixed again. Some staff and accommodation related costs might behave in this way if the company expands or contracts significantly.

Some expenses can be identified directly as belonging to the new class of business. For example direct expenses from a department set up to deal with the new class.

Other direct expenses do not have a direct relationship to any one class of business and need to be apportioned between the appropriate classes eg by a broad split or by looking at extra staff taken on..

Some expenses are indirect. By definition, the departments concerned are not related directly to any particular class of business, but form a support function for the provider. In this case, it is necessary to find a sensible apportionment of the expenses across direct activities. Initially, these costs could simply be added at the end of the analysis as a percentage loading to all the other attributed costs

As well as apportioning expenses to a line of business, costs need to be apportioned by function. Can split this into the costs of:

- securing new business

They will include marketing, advertising, sales and commissions, processing and policy issue and underwriting

- maintaining existing business (renewal and investment)

- terminating business (including claims)

.

When loading for expenses, it must be ensured that sufficient premiums are charged to cover the costs of expenses relating to the new product and provide a contribution to the general fixed costs of the provider. Loadings should also take into account the timing of expenses and be matched accordingly. Must also consider the competitive position.

The loading for expenses could be allowed for as follows:

- as a fixed amount per contract
- as a percentage of the premium charged
- as a percentage of the sum assured

or a combination of the above.

(iii) A margin costing approach would only consider expenses directly related to this new product. As such it would be simpler and cheaper to adopt

It will also lead to lower initial premiums, which may make it easier to sell the policies.

If, as a result, the volumes of business are larger than anticipated, fixed costs may be proportionately reduced over all products so creating a virtuous circle.

However, a large increase in volumes may cause a steep rise in fixed costs eg more accommodation or technology so increasing relative fixed costs.

Using marginal costs longer-term would mean that other business was subsidising the new product, possibly affecting sales in other product lines. But moving away from the marginal could mean losing business on the new product.

In practice a lot may depend on how significant the pet product is. Given the nature of the company, it could be that this line is trivial in the overall scheme of things. It may be sold in conjunction with or as a rider on other lines via the same channels. That is, only marginal costs are incurred and they are small anyway so a quick simple approach is valid.

We had lots of imaginative points on part (i) and many scored very well. In part (ii) the better candidates demonstrated their understanding of the core reading and highlighted the issues arising due to this being a 'new' policy. Part (iii) was less well answered; many did not grasp the concept of marginal expenses.

5 (i) (a) The yield gap is defined as:

Equity gross dividend yield (d) – GRY on a **long dated** conventional government bond.

(b) The total return on equities can be expressed as $d + g$ (expected growth in dividend income).

This total return can also be expressed as GRY – inflation risk premium (IRP) + equity risk premium (ERP).

IRP which applies to GRY's on conventional bonds is less of an issue for equities given the implicit inflation hedge. (i.e. total return on equities = risk free real yield + expected inflation + ERP (where ERP also covers any small IRP))

Hence the yield gap can be expressed as

ERP – IRP – g.

If the yield gap is high this may indicate that the ERP (net of IRP) is relatively high, an indication of higher relative equity risk.

… if it isn't simply an indication that g has fallen as a result of a general deflationary outlook (bonds are relatively more attractive in such circumstances)

(ii) As stated in the question, the gross redemption yield for each bond can be expressed as:

GRY = risk free real yield +expected inflation + IRP + bond risk premium (BRP)

Given that the key features i.e. term, coupon and nature are similar, risk free real yield, expected inflation and IRP can be assumed to be the same for each bond.

(although may be different if yields very sensitive to slightly different durations or other features eg convertibles)

This implies that the 0.5% extra yield on B is due to a higher BRP for B.

The BRP is chiefly dependent on margins required for default risk and lack of marketability risk.

The reasons for extra default risk with B's bond could be due to B being in a more risky sector or because of specific issues relating to B (e.g. higher gearing or poorer management).

For marketability, the issue size of B's bond could be relatively low or it may not be quoted on a recognised exchange.

(iii) An investor should select investments that are appropriate to the nature, term and currency of any liabilities.

Allowance should be made for the investor's appetite for risk.

Subject to the above, the investments selected should seek to maximise the overall return on the assets.

Where the overall return includes both income and capital proceeds and is net of tax/expenses.

(iv) The notional portfolio should represent the assets the insurance company could expect to hold in respect of this line of business. *(In effect, instead of assessing the expected returns on a large portfolio of assets, the method involves assessing such returns on a representative sample – quicker and less costly).*

So the answer has two parts:

- Selecting an appropriate investment strategy.
- Selecting a portfolio that represents this strategy.

The assets should match the liabilities. Hence the assets should have a spread of terms (durations) and coupons (proceeds) that are needed to meet liability outgo.

However, this market is likely to be competitive and so the company may wish to move away from a matched position or take other actions to boost expected return (i.e. risk).

Hence a different term/coupon pattern may be appropriate

Some overseas bonds may be deemed to be suitable.

A way to boost expected returns could be to invest in non-government stocks

Hence the company would need to decide on a government/corporate bond split.

Within the corporate bond allocation, proportions reflecting different credit ratings (e.g. AAA, AA, BB etc.) and industry sectors would be needed. An argument could be made for an allowance for unquoted or otherwise less marketable bonds.

It will then be necessary to pick a representative sample together with the relevant weighting given to each constituent of the sample.

Alternatively, market indices may exist that gives an accurate reflection.

In practice, for simplicity, a particular bond may exist in the market that could be viewed as reflecting a group of assets the insurance company would hold.

The insurance company may construct artificial bonds (perhaps using derivative pricing methods) that have the required characteristics.

(v) A particular problem here is that the portfolio is only looking at conventional bonds. Depending on the types of contract sold, investment in index-linked bonds may be more appropriate. This point could be extended to cover other real assets but, given the nature of the business this is debatable.

Linked to this point is that using a notional portfolio may mean that esoteric bonds or those difficult to categorise are not invested in (when otherwise they might have been) simply because they are hard to fit into a notional portfolio.

Taken further, a notional portfolio approach may lead to a "lazy" approach to actual investment as the notional portfolio ends up driving actual investments. That is there is a tendency just to hold the notional portfolio because it's the easy option.

The main problems will probably relate to selecting the sample.

Representative bonds or indices (e.g. with a long enough term) may simply not exist.

Alternatively, the required portfolio could become so fragmented that it doesn't actually meet its objectives of cost savings.

Likewise, the expense and effort involved in constructing a sample (artificial bonds) may lessen the benefits of the approach.

Making compromises may mean that the portfolio doesn't do what is intended. For example there will be subjectivity over particular choices that appear to be the same but aren't quite.

Even if the portfolio were valid at a particular point in time, it may not be if market conditions were to change – so rebalancing would be needed.

In theory, every time the investment strategy was changed, a new notional portfolio would be needed – so more rebalancing would be needed.

This would be particularly troublesome if the insurance company took an active (as opposed to passive) approach to fund management.

Likewise, every-time the liability profile (or the insurer company's attitude to risk) changed the portfolio would need to be changed.

The insurance company may decide to base the notional portfolio on what the long-termed matched position should be. But this approach would ignore the impact of tactical or strategic investment decisions when pricing the business.

Part (i) was badly answered for a bookwork question. In part (ii), better candidates explained how the BRP may vary. In parts (iv) and (v) many candidates were unsure about the use of "notional" portfolios in relation to pricing rather than valuation.

6 (i) The first point to make is that the reasons are not necessarily due to the expected total cost of the benefits. It is quite possible to have a defined benefits scheme with cheap benefits and vice versa there is nothing to stop an employer paying a lot towards a defined contribution scheme.

However, this particular scheme may be generous and hence expensive. The risk is that the expected future benefit costs are too high for the employer to meet. The decision to close the scheme may thus be cost driven.

It is more likely that the risks relate to volatility in costs and/or the expenses (including time, hassle and obligations) involved in providing a defined benefits scheme. In particular, the risk of unexpected increases in contributions required from the employer

Under a defined benefits scheme, the benefits payable on any contingency are set out in the Rules of the scheme. Ultimately, if any funds set aside from contributions prove insufficient to provide for these benefits the employer will, most likely,be obliged to meet any shortfall.

In particular, there is the risk that poor investment returns on the scheme's assets will cause such a shortfall.

Likewise, there is the risk that improvements in pensioner mortality will mean that beneficiaries live longer than expected so increasing costs.

Other adverse demographic experience could be a risk. For example if relatively generous benefits are payable on death, ill-health or early retirement, then worse experience than expected could cause volatility in contributions required.

The company is relatively small and hence there is a risk that the expenses required to operate the scheme (paid directly or to 3rd parties) will increase to unsustainable levels.

There are considerable regulatory risks as legislation surrounding defined benefits schemes can be considerable, complex and costly to implement.

In particular, it is likely that the authorities will require regular valuations to check on the solvency of the scheme. The authorities may well specify the method and assumptions to be used for such valuations.

This basis may be conservative and so increasing the chances of deficits. The authorities may require significant one-off (or over a short-term) payments from the company to remove these deficits.

Similarly, the authorities may require contribution rates to be calculated using a conservative basis.

Furthermore, the effect of such bases or other specific regulations may constraint the scheme's investment strategy. This could reduce expected returns and so increase contributions.

Accounting regulations in particular concerning the treatment of deficits, discretionary benefits or accrual of benefits could introduce volatility to contributions or reduce profits shown in the accounts.

To a degree, it is not so much the legislation itself, but the uncertainty surrounding changes to legislation or its interpretation that causes problems. Pensions are often a political football. Likewise taxation policy could change, particularly if tax breaks exist.

Such regulation is expensive to implement and maintain. This is particularly true if industry wide compensation schemes are set up. Ultimately, funds to support regulation etc will come from the schemes.

The authorities may interfere with the benefits a scheme must provide. For example they may introduce changes in respect of early leaver benefits, pension increases or death benefits. Such potential interference increases uncertainty.

(ii) Changing the nature of the scheme will remove some of the risks described in (i). However, many of those risks are now transferred to the employee.

In particular the benefits of the employee are not defined but are uncertain. The employee is exposed to poor investment returns and increasing longevity (via annuity rates). This uncertainty will not be popular.

It is possible that ancillary, enhanced benefits e.g. on death or ill-health will not be as good as they will now be determined by individual fund values. Such benefits may, however, be insured at the old levels.

If the old scheme regularly gave discretionary benefits, these could be lost. However, such benefits may have arisen due to higher than required contributions which will now be allocated directly to employees' pots.

It is likely that the expenses of running the old scheme were, at least partially, subsidised by the employer. If the running of the fund is transferred to a 3rd party, then these expenses will come out of members' funds. Given the potential administrative complications of the new arrangement for a relatively small workforce, expenses may increase significantly.

The company will contribute but at what rate? It may be difficult to convince employees that any given rate will be sufficient especially if employer contribution rates have been volatile in the past.

This problem is exacerbated since the total contribution rate required to fund the future service benefits that would have accrued under the old scheme will be age (and sex) dependent. Older people (and women) will need higher contributions. Whether they get them (unlikely) or not, problems will arise.

Likewise, married employees may want a higher contribution rate since otherwise they will end up with a lower pension than single employees.

Questions may be raised concerning the security of the benefits retained in the old scheme. Employees may be worried that if funds in that scheme are not sufficient, the employer may wind-up the scheme or buy benefits out on terms unfavourable to employees. This is more likely in the future as expenses of running a declining fund increase.

If surpluses were to arise in the old scheme, the employer may try to use them for their benefit.

Irrespective of the company's intentions, employees are likely to take the view that this change (or indeed any change) is being introduced with the intention of cutting costs and so making employees worse off.

Problems will arise if competitors are not (or have not) introducing similar changes.

Employees of an industrial company may well be unionised or otherwise organised and hence be able and willing to take action.

(iii) The contents can be broken down into factual details concerning the new scheme and forms to enable the employees to make any choices required from them.

The core facts will cover issues such as:

- Date of scheme inception
- Employee and employer contribution rates
- Description of benefits (including options) and how they will be determined i.e. what a defined contribution scheme is and how it works
- Party managing and/or administering the funds
- Range of investment vehicles available
- Expenses and charges deducted from members' funds
- Whether and how accrued benefits can be transferred to the new scheme
- Legislative background e.g. security of benefits, employer's obligations etc.

Simple illustrations may be given of the effect on employees' expected benefits.

The employee will have a range of choices and the documentation will specify what these are, incorporate the relevant forms and say what the employee must do next and what will then happen.

The principal choices will cover whether or not to join the scheme (maybe for death benefits only), treatment of accrued benefits and choice of investment fund.

To protect the employer, there may be a recommendation that employees seek independent financial advice before making any decisions.

(iv) When communicating potentially complex ideas, it is important to try to ensure that communication is done in such a way that the audience will be able to understand what is being said.

To this end, any documentation should be simple, clear, concise and easy to follow.

The media used (internet say) should be appropriate to the intended audience.
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To this end, the format should be appropriate e.g. Q&A briefers etc

Technical terminology or jargon should be avoided or if this is not possible, explained fully.

The tone and style should be suitable for the employees of this company.

However, it is important not to treat the employees as if they are stupid. So documentation should not be patronising or condescending.

It may be possible to employ communication consultants to help with such stylistic issues.

The documentation needs to relate to the purpose. This is likely to cover keeping the employees informed about the progress of the scheme, describing how the scheme works and enabling them to make informed choices.

Accordingly, this means that the documentation will need to be thorough and comprehensive. This involves a trade off with the need for clarity and simplicity.

It will be important to satisfy any legislation or industry codes of conduct/best practice. Again professional advice may help with content

Anything that is said must be correct and not be ambiguous or misleading.

In particular, any projections of future benefits or comparisons against other types of benefits must be compliant.

The company will probably not want to give specific advice or recommendations nor will it want to make subjective judgements about possible future experience etc. To do so may make it a hostage to fortune and in any event, it is unlikely to be allowed by legislation.

There will be a need to take into account data protection issues and not disclose commercially sensitive information or breach confidentiality clauses (e.g. with advisors or insurers).

In the initial documentation it is likely that the employer will want to briefly set out the background to the introduction of the new scheme and give the justification for it.

For example:

The attractions of the new arrangement should be set out. In particular, emphasis will be given to relative simplicity, transparency and a lack of cross-subsidy.

The likely advantages to early leavers i.e. benefits are more portable should be stressed. It will be mentioned that more people are likely to change employment in the future than in the past.

The employer will probably want to stress that they have taken professional advice to ensure, that under the most likely future conditions, employees' expected benefits will not suffer.

(v) Given the likely reasons for the changes, it is unlikely that the employer will look favourably on this request. The proposal appears to give a guarantee to employees insuring them against poor experience. Presumably if returns had

been very good, the employees wouldn't be offering to pay money back to the employer

Principle of fairness to all employees should apply. That is, those who chose the "wrong" option shouldn't be helped if other employees aren't being helped as well.

When putting their case the employer will need to distinguish between its legal obligations and any compassionate or paternalistic desires it may have (or a need to prevent industrial disputes). The arguments could take the form of "we understand your problems and sympathise with you. Even though none of this is our fault or responsibility, we are prepared to listen and do what we can".

And may offer to consider non-financial changes to how the new scheme is governed, for example works council involvement

Problems could arise if the employer has been negligent or failed to communicate the necessary information clearly enough. They will need to consider what employees were told and if they were potentially mislead, the employees may have a case.

The employer's point of view is likely to be that they fully and clearly explained the arrangement and the potential consequences (good and bad). The employees were free to choose whether or not to join the scheme and so the employer is not responsible for any unfortunate developments.

An important consideration is that employees had a range of funds to choose from and they made the choice as to where their money was invested. In particular, the employer was not allowed to influence this choice or give advice and so cannot be held responsible for "poor" choices.

However, if the choices offered by the designated insurance company were narrow (e.g. no fund of funds) then some blame could attach to the employer.

The implication is that some employees who are now receiving pensions invested in the equity fund.

Firstly, those employees were ill advised to put contributions into a volatile fund when they were close to retirement – they should have been made aware of this. The rationale of switching funds into less volatile vehicles as employees get older should apply. In particular, the employer may say that the employees' representatives are responsible for giving such advice

Furthermore, given that they are now in retirement and the new arrangement is only 5 years old, it is likely that the pension relating to the new arrangement is small (either absolutely or relative to the benefits from the old scheme). Clearly, if benefits from the old scheme were transferred into the new scheme, there is more of a problem.

Benefits do not just depend on fund values. If unit prices are low because of high real interest rates, then annuity rates will be attractive to retirees. This link is clearer with bond type funds.

Although depressed equity markets and low bond yields could compound problems.

In the case of members further away from retirement i.e. where equity type investment can be justified, a longer term perspective is needed.

Equity markets are volatile and it is hoped that over the long term, returns will be better than from other assets. Short term falls may not reflect the position over the longer term. In fact, lower prices now could represent an opportunity since if contributions are invested now, there is more upside potential. The effects of regular contributions over a long period can partially offset market volatility.

In particular, any projections are based on specified assumptions and hence they cannot really be relied on to reflect actual benefits payable.

However, if the employer (after taking advice) feels that low returns are not a short term phenomenon, they may be persuaded that an increase in contribution rates could be appropriate. That is, the conditions assumed when the rates were determined are no longer valid.

We are assuming that the price falls are market related. If this is not wholly the case i.e. the chosen insurer or domestic equity fund is doing relatively badly, then, changing the insurer or putting pressure on them to perform better may help.

The conditions associated with poor equity returns could imply falls in salary. Hence benefits from the old scheme would also fall.

Likewise, the business environment may mean that the company is struggling. So despite what it wants to do, it simply cannot afford to make additional contributions.

In part (i) most candidates were able to discuss cost but only the better candidates picked up on the volatility issues. Part (ii) was generally well answered. In answering parts (iii) and (iv), some candidates focussed largely on pension-specific issues, and did not pay sufficient attention to wider 'communication' points. Part (v) was generally done well, though many candidates did not answer in sufficient length/depth for the marks available.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

19 April 2011 (pm)

Subject CA1 — Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 (i) Outline how tax policy can be used to influence the demand for and provision of state benefits. [3]

(ii) Discuss ways in which a government can use the tax system to encourage individuals to make savings. [5]

[Total 8]

2 In conjunction with a marketing promotion, a life insurance company has decided to offer a free one-year term assurance product to mothers of children born during a particular promotional period. The sum assured is £10,000 payable on the death of the mother if this occurs before the child's first birthday.

Application forms are included in a pack given to prospective new mothers.

(i) Outline the assumptions that the life insurance company would need to make in order to evaluate the size of the risk being taken on. [2]

(ii) Discuss how the risks taken by offering this product can be managed. [6]

[Total 8]

3 Describe, for each of the following investors, the characteristics of the investor's financial commitments or other objectives that would influence the type of assets they should hold (you do not need to consider the suitability of specific investments):

(a) A childless middle-income couple both under age 30 who are saving for an extended round-the-world holiday.

(b) An unemployed single parent who has just received a moderate lottery win in the form of a cash sum equal to six times his annual income. His annual income consists wholly of state benefits.

(c) A 35 year old high net worth financial trader with a substantial income who is considering what to do with her annual bonus, which is equal to 40 times national average earnings.

(d) An investment fund, targeted at wealthy individuals, that aims to generate significant returns from investing in commodities. The fund guarantees that the value of any individual's holding will be not less than 25% of the gross amount they have invested.

[16]

4 (i) Describe scenario analysis, stress testing and stochastic modelling. [4]

A large international insurance company has offered insurance to the agricultural sector for a number of years. With increasing concerns about the potential impact of climate change, the company is considering the ways it can improve its risk modelling.

The company has a large amount of data collected over ten years of providing this insurance. The format of the data varies between different territories.

(ii) Discuss the suitability of each approach described in part (i) for the company's risk modelling. [8]

[Total 12]

5 (i) List six tools used in capital management. [3]

(ii) Discuss, giving examples, how each of the tools listed in part (i) could be used by providers of financial products to manage their capital. [12]

[Total 15]

6 Over the last three months, the government of a large developed country has cut the rate of interest charged on the very short-term loans that it makes to the banking sector from 6% pa to 1% pa. Yields on other money market instruments have fallen in a similar way.

(i) Discuss how this change may affect the interest rates charged on:

(a) Mortgage loans used to purchase domestic residential property.
(b) Balances outstanding on individual customers' credit card accounts.

[10]

A large financial institution has a significant credit card business covering a wide range of personal customers in its domestic market. Different customers are charged different interest rates appropriate to their circumstances. Following the changes in short-term interest rates, the institution is reviewing the interest rates it charges to its credit card customers.

(ii) Describe the process the credit card company would use to establish a revised interest rate charging structure. [6]

(iii) Discuss how the company will assess the effect of variations in experience. [5]

[Total 21]

7 A company which previously sold with profits life assurance directly through employed agents is now closed to new business. The company is collecting data in order to investigate its mortality experience.

(i) Explain why ideal data for this purpose may not be available. [2]

(ii) Discuss how the company can use the limited data it has collected. [4]

The company has publicly stated its commitment to treating its customers fairly.

(iii) Discuss why the company has made this commitment. [5]

In recent years bonus levels on the remaining in-force policies have fallen. Some policyholders have written to the company in response to these falls, to complain that they have not been treated fairly.

(iv) Outline the points the company may make in response to these complaints. [9]

[Total 20]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2011 examinations

Subject CA1 — Actuarial Risk Management

Paper Two

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.

T J Birse
Chairman of the Board of Examiners

July 2011

General comments

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.

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) The state uses tax policy to influence the behaviour of citizens.

A state may provide a minimum safety net for its citizens that is in effect means-tested.

It may use the tax system to incentivise citizens providing for themselves, and consequently reduce the demand for state benefits and the cost to tax-payers, for example retirement saving or health insurance. It may also use the tax system to provide an incentive to work.

More directly, the state may levy tax on state benefits or on people who receive them, and so discourage claims or reduce their net cost (especially if benefits are not means-tested).

(ii) Tax relief can be granted on pension contributions. This can be used to encourage citizens to save for retirement to avoid a future burden on the state.

The state can restrict when benefits can be taken on retirement.

By simply deferring the taxation it will be able to charge tax at the point benefits to other citizens need to be paid.

Lower tax rates could also be applied on benefits e.g. a tax free lump sum on retirement.

The state will also want to encourage individuals to make other savings and to continue to hold these savings. It can provide beneficial tax in roll-up rather than providing tax relief at outset.

Or seek to restrict circumstances when tax-advantaged savings can be drawn, or target tax relief on certain groups

There will usually be limits on the amounts that can be saved to control the cost versus the benefit to the state of granting the tax relief.

Most candidates picked up the basic bookwork but surprisingly few candidates scored well by setting out further ideas. Many did not explore the angle of controlling costs as a government objective.

2 (i) Will need to estimate the number of policies being taken on by:

Estimating the number of births expected in any year.

Estimating the number of mothers that will take up the offer, which will probably be dependent on how the offer is communicated.

Estimating the age of prospective mothers and using mortality tables to calculate likelihood of death (allowing for peri-natal mortality).

Consider the length of the promotional period.

(ii) The main issue is that the company has taken on the risk but with no premium in which to offset it.

It will need to actively manage risks by monitoring the number of contracts issued and the numbers of deaths.

Consider diversifying the risk away as part of a broader portfolio.

Could use reinsurance to transfer some of the risk.

Ensure that the person is actually a new mother i.e. underwriting at point of application.

Consider restrictions on the offer, for example country of residence.

Ensure that the claims control procedures work, i.e. underwriting at point of claim.

Implement control systems to reduce operational risks such as financial fraud.

Must also monitor the expenses associated with these policies.

Will need to determine an appropriate amount of capital to hold against the risks accepted.

In determining the appropriate amount of capital will need to determine the expected cost. This will be based on cost estimates and use sensitivities to consider what the worst case scenarios could be. This could be expressed as a ruin probability over the year.

Sensitivities will be in relation to key parameters, for example number of births, take up rate or mortality.

Will need to consider length of the promotional period or how it will be financed in the long term. For example if it will be financed by the profits the life insurer might generate from selling longer terms/higher sum assureds to mothers, or from sales of other products.

If product is being used to generate sales elsewhere will need to monitor the level of sales generated. Will also need to ensure risks from these sales are actively managed, to ensure these lead to profits.

Care as to terms and conditions, especially in relation to maternal death around the time of the birth

This was a question where better candidates differentiated themselves, in particular picking up the points from the question that this is a marketing exercise with no payment of premium, and discussing issues beyond mortality such as business volumes and cross-selling.

3 (a) They will need to fund their current living expenses with any additional income likely to be used to save for the holiday, and will also need to allow for longer-term financial commitments (pensions/etc).

The amount needed is likely to be a fixed cash sum.

Probably short term and known e.g. need the funds in 3 to 5 years say.

Will need liquidity, certainly once trip starts i.e. possibly lots of small outgoings for duration of holiday.

Could be some uncertainty over cost or duration if not pre-booked yet.

May be some in foreign currency. Could be significant if a lot of things not pre-booked.

Main impact could be a need to avoid risk i.e. they have a definite objective they want to meet.

May need funds as a reserve e.g. to cover property or pension contributions whilst away.

(b) Most liabilities will be short term and real in nature.

May have debts to clear e.g. loans or credit cards.

Probably want to spend some as a treat e.g. presents for children or a holiday. So again part of cash win is spent quickly.

May have immediate capital spending needs (car/housing/etc.).

May wish to use win to help with current or future income potential so could be longer term and more real.

For example could use towards training or childcare costs enabling part-time work say.

Alternatively could invest for the longer term with a need for real growth.

Will be concerned over the security of assets so low risk investments are likely to be suitable.

Perhaps make provision for education costs, trust fund for children or for personal savings against unexpected outgo.

Would have to consider tax position e.g. on the win and impact on other income e.g. benefits paid from the state.

(c) Unlikely to have any specific liabilities as such either in terms of current outgo or a specific need to save for the future.

Hence consumption on luxuries e.g. boats, planes etc. may be the objective.

Alternatively, could engage in high risk, speculative investment projects e.g. venture capital, sports clubs or property development. Looking for significant returns (or utility).

Will wish to make any investments as tax efficient as possible.

Maybe could use funds to secure future income so look at long term real growth. Enabling the individual to retire early and follow a different (less financially rewarding) career e.g. farming.

Altruistic or charitable donations (or supporting family e.g. parents) could be a factor.

(d) The liabilities are determined by the investment mandate i.e. to invest in commodities.

This mandate could be narrow e.g. a specific range say certain agricultural products or very wide covering everything that could be defined as a commodity e.g. currencies.

Given the target market, there should be no limits imposed by fund size (some commodities may be traded in large units) or by a need for simple products or approaches.

There is a desire for high returns. This implies a high-risk strategy. Hence speculation by using gearing may be appropriate.

However, some liquidity or capping/monitoring of exposure will be needed to ensure that the guarantee can be met.

The period over which the guarantee will apply and/or any indication of the term returns are to be measured against (e.g. a strategic take a position fund or a trading fund) will be a factor.

Some candidates made introductory comments on investment principles, which was helpful to avoid repetition. But to score well we looked for candidates to make comments on the

specific circumstances in each part. Weaker candidates did not do so – for example in (a) not focussing on the holiday (although some marks were available for comments on other potential commitments). Some candidates wasted time by commenting in detail on specific investment classes, particularly in (c), despite the question stating that this was not necessary.

4 (i)

Scenario analysis

For each group of risks a representative plausible scenario is developed.

For each scenario the consequences of the event occurring are calculated.

A number of different scenarios may be considered.

Stress testing

Modelling of extreme changes and scenarios.

Will be looking at correlations and volatilities which are observed to simultaneously increase during extreme events.

Aim to identify weak areas by looking at effect of different combinations of correlations and volatilities.

Key area is constructing appropriate stress test scenarios.

Stochastic modelling

Variables are modelled using probability distributions.

Dynamic interaction between variables.

The result will be a distribution of outcomes.

(ii)

Large quantity of data will help with parameterising, making it easier to set up models (particularly for stochastic) although a 10 year period may not be long enough in this case.

Different data items in territories may lead to some parameters being easier to analyse than others – consider the common factors recorded in all territories.

Different territories displaying different trends may lead to complications for the modelling, which may lend itself more towards scenario analysis as an appropriate method.

Scenario analysis

Scenario analysis is useful when a full mathematical model is inappropriate.

Given uncertainty and therefore difficulty in projecting climate change this is likely to be the case.

For the risks being modelled it will be possible to pull together plausible scenarios (including particularly adverse scenarios).

The consequences of scenarios occurring may be more difficult than constructing the scenario.

Scenario analysis removes the risk of using many subjective parameters and may be easier to communicate than other approaches.

While scenario analysis can help in showing the impact of different scenarios, it does not assist with the relative likelihood of different scenarios.

This means that the likelihood of different outcomes is not apparent.

The choice of scenarios requires external input, this in turn is critical.

Stress testing

Identifying the key climate risks to be tested will enable stress testing to show weak areas in the portfolio.

Must be able to consider interaction with other parameters (e.g. financial) to check for weaknesses in portfolio.

Considering extreme potential scenarios for climate change stress testing would appear to be appropriate, particularly given the wide range of scenarios predicted by experts.

Difficulty in identifying appropriate correlations for other parameters may make stress testing less suitable.

Need to consider sensitivity of portfolio to extreme movements in parameters, which may be difficult to model.

Stochastic modelling

Shows a distribution of possible outcomes, which provides a more complete picture than other approaches.

By only allowing some parameters to vary stochastically it may be possible to focus on the particular risks which are of interest.

Stochastic models require a probability distribution to be applied to parameters which may be difficult to derive, and will require expert judgement.

Also requires correlation and interaction between parameters to be set up which may present further difficulties.

Computationally intensive approach which increases costs.

Generally answered well. The main problem on (i) related to confusing scenario analysis and stress testing, not emphasising extremes in stress testing. Good candidates related the bookwork in (i) to the situation in (ii).

5 (i) Any six of:
Financial Reinsurance (FinRe)
Securitisation
Subordinated debt
Banking products
Derivatives
Equity
Internal

(ii) **Financial Reinsurance**

This aims to exploit some form of regulatory arbitrage in order to manage the capital, solvency or tax position of a provider more efficiently.

It frequently relies on the regulatory, solvency or tax position of a reinsurer, which may be based in an overseas state, being different from that of the provider.

This can be used to provide a capital benefit to an insurance company although there will still be some risk transfer involved.

This will be in the form of a reinsurance contract between the reinsured and the reinsurer e.g. discounted covers.

Securitisation

Securitisation involves converting an illiquid asset into tradable instruments.

The primary motivations are often to achieve regulatory or accounting off balance sheet treatment.

Typical transactions will be structured with an element of transfer of the risk associated with the value of the asset. This will result in any potential loss in value of the asset being capped.

The securities will be backed by assets and their cash flows eg mortgages, student loans or other loans.

Subordinated debt

Capital can be raised through issuing subordinated debt in the capital markets. The main aim will be to generate additional capital that improves the free capital position of a company.

An insurance company could issue debt through a stand-alone subsidiary, which would be guaranteed on a subordinated basis by the company, i.e. the repayment of the debt is guaranteed only after the policyholders' reasonable expectations have been met.

The debt can be dated or undated, though this will impact the amount available as an admissible asset and may impact the tax implications.

An example is where the debt repayment comes after all reasonable expectations of policyholders have been met, including non-guaranteed bonuses, if any. The liability for repayment will not need to be included in the assessment of solvency.

Banking products

The banking sector can provide direct capital management solutions for an insurance company.

- Liquidity facilities can be used to provide short term financing. This may be very useful for a company facing rapid business growth.

- Contingent capital can be a cost-effective method of protecting the capital base of an insurance company.

  For example, an arrangement may provide capital as it was required following a deterioration of experience (i.e. it is provided when it is needed). Although these arrangements clearly improve the financial strength of an insurer and can be given credit for by a rating agency, they lack visibility.

- Senior unsecured financing directly for an insurance company would not have capital benefits as the loan would be treated as a liability on the company's balance sheet.

  Financing at the group level can, however, be used within a group structure to provide capital to insurance subsidiaries, for example a loan could be made. It can be more cost effective than other forms of capital but clearly has financial strength implications at the group level.

Derivatives

A derivative strategy can assist in the efficient management of a business and serve to reduce risk.

Prudent management requires that any provider entering into derivative contracts must exercise caution.

For example, a derivative contract could be used when a fund manager is concerned about the impact of a fall in equity values. It could enter into a contract to protect its equity portfolio falling below a certain level. Potentially, the cost of this downside protection could be partially met by the sale of some upside potential via a second derivative contract.

Equity

Increasing equity can be used as a source of capital. A proprietary company can raise funds through the issue of shares although this option is not available to a mutual. This will increase assets without increasing regulatory liabilities.

For example, equity may come from a parent company, from existing shareholders, by a rights issue or directly from the market by a new placement of shares.

Internal

The existing financial structure of an organisation could be reorganised in a more efficient way. This could result in lower cost of capital or lower expenses.

For an insurance company any of the following could be suitable:

- funds could be merged
- assets could be changed, for example to improve statutory funding if admissibility/matching are constraints
- the valuation basis could be weakened
- the distribution of surplus could be deferred
- capital could be retained in the organisation possibly by not paying dividends to any shareholders

This was answered well by candidates who knew the bookwork, but many others scored very poorly. We gave credit to candidates who made valid comments in (ii) even if they missed the bookwork.

6 (i) (a) Mortgage loans are typically long term up to 25 years.

Hence, in theory, interest rates on mortgages should be linked to yields on medium to long-term government bonds.

In general, such drastic cuts in short rates will also bring long rates down e.g. due to recession and low growth prospects.

However, the fall probably won't be as large due to the uncertainty over the long term (risk margins), inflationary worries or concerns over government funding issues.

But in practice, in many countries mortgage rates are linked to short-term interest rates.

This may be because:

- Short-term rates are more visible and easier to understand for consumers.
- Many mortgages are repaid early or otherwise altered or renegotiated so terms are in fact shorter than they might appear.
- Many providers fund mortgages from short term finance – customer deposits or money markets.

Mortgage rates are unlikely to fall by as much as short-term interest rates due to the default risk. They will also be dependent on the savings rate.

The circumstances leading to drastic cuts in short rates are likely to be severe. Hence risk margins on all non-AAA rated government loans should rise.

But mortgages will be secured on property so there is less risk. But this factor will be tempered by the likely depressed housing market and the problems of being a forced seller to recoup the loan.

Any patterns may be distorted by tracker mortgages where rates charged are explicitly linked to a given market rate e.g. the rate referred to in the question.

Likewise, many mortgage rates may be fixed for a set term and so they won't change – unless they are repaid (probably incurring a big penalty).

Competition could lead to a reduction in rates. It is possible that these circumstances will mean that there is a reduction in the competition and so this may not be the case.

(b) Credit card balances represent variable rate unsecured short-term loans.

Hence, in theory, interest rates charged on them should be influenced by short-term money market rates.

The credit card company will borrow in the market and lend to its customers making its profit from the difference between borrowing and lending rates.

All things being equal, a large fall in market rates may be expected to lead to falls in credit card rates.

However, things are not equal. Credit card loans are unsecured and so the lender is exposed to significant bad debt/default risks.

As above, it is likely that the fall in market rates is linked to difficult economic circumstances. This will significantly increase the risks lenders face.

Risks will vary depending on the customer (eg amount owed) and on individual company's lending practices. So rates charged will vary anyway.

The impact of events may exacerbate such variations. "Good" risks may see falls in rates whereas "bad" risks may incur increases in rates charged.

Financial companies may be in difficulties and so increasing rates on credit cards maybe a way to boost profit margins.

Legislative or administrative factors may come into play. Legislation may require a period of notice to be given before a change or there may be restrictions (e.g. on absolute or relative rates chargeable). Also, the desire not to change rates too often may mean reaction to falling market rates is deferred.

Many customers may be on fixed term low interest arrangements eg in conjunction with new accounts or balance transfers. These will dampen the impact of changes.

Competitive pressure may reduce rates but as in (a), it is possible that these circumstances may reduce this pressure.

(ii) The first step would be to set profit criteria.

This could be set in relation to the company as a whole or in respect of the credit card business alone. It may differ from existing targets.

For example, the aim could be to increase expected profits from this business to offset losses elsewhere. Alternatively, the company may have to accept lower profits if charges needed to boost profits were commercially unacceptable.

The methodology would be to run a profit model based on cashflows using different proposed charging structures.

The optimum charging structure would be the one that comes closest to meeting the profit criteria both in terms of expected profit and variability of profit e.g. a lower but more stable projected profit maybe better.

The company will need to set a time period for the model. That is it will assess expected cashflows over a given period and project earnings arising.

One year might be a suitable period. It is unlikely that the company will want to change charges too often. However, given that it is likely to be able to do so relatively easily a long projection period would be pointless.

Because different customers pay different charges,

the model will need to cover a representative sample of customers. That is suitable model points will be needed.

The charges themselves will affect experience and so must be part of the modelling process. For example higher charges may lead to more bad debt.

The company may be able to model some of the key variables stochastically e.g. interest rates or economic growth. This will in itself give an idea of the possible variations in profit from a given charging structure.

However, it may prove impractical to treat all the key parameters as stochastic variables. Hence sensitivity analysis should be adopted

The model could be re-run with different core parameter values. This would give greater insight into the possible variations in profit.

There will need to be a market comparison of the rates.

(iii) In order to assess the effect of variable experience, the company needs to identify the key influences on cashflows and model how changes in these parameters will affect its net revenues.

Significant factors to model will include:

Borrowing costs. It is likely that short to medium term borrowing is used to finance credit card balances. Hence the company will need to look at possible variations in the costs it faces.

Bad debt experience. Many customers may be unable to make repayments and so provisions i.e. deductions from profits will need to be factored in. The company may need to look at both numbers of defaults and average amounts of write-offs.

To assess the proportion of defaults, the company could model the impact of varying say unemployment rates, economic growth or interest rates.

Bad debts would vary by customer – hence the need for comprehensive model points. For example the level of debt customers have (related to income or assets) may matter.

Average balances over the year would need to be modelled.
These could vary due to people repaying more, less spending by existing cardholders, new accounts being set up or customers transferring to other providers.

Again economic conditions will be a significant influence here. However, charges made by competitors will also be relevant and so the impact of how they react will need modelling.

Expenses may vary a lot e.g. more bad debt implies more work and hence a greater drain on profits.

It will be necessary to correctly allow for correlations and interactions between these parameters. For example the level of economic growth will be a major factor and so the assessment of its impact must be consistent.

This question was generally not answered well. In (i) we were looking for comments specific to the question rather than generic discussion of economic principles. Good candidates did make these points relevant, for example by commenting on default risks and the difference between long/short interest rates.

7 (i) Ideal data may not be available if data was not captured at a sufficiently detailed level when the policies were initially issued. If the premiums were collected at the door by an agent, only limited data may have been captured on the insurer's database. Also some of the data may be old and may contain errors.

There may be insufficient data to provide a credible result. There is no new business being written and so the number of policyholders will be reducing each year as policyholders die or lapse their policies.

(ii) The company may need to use summarised data. It should, however, be recognised that the reliability of the values will be reduced, as full validation of the data will be impossible.

Ideally the data to be analysed should be split into homogeneous groups, for example, by age and sex. Any heterogeneity in data groups can distort the results.

However, where data is scarce, which may be the case at some ages for this company; this may result in data groups that are too small to enable any credible analysis to be carried out.

Data may need to be combined into groups which are large enough to be credible. There will need 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.

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.
The data can then be used to compare actual deaths to expected deaths over the period of investigation.

(iii) This will be necessary because of the complexity of financial products, their long duration, and the financial impact that unfair treatment could have on customers.

These conflicts are exacerbated by the fact that many benefits or charges can be varied at the discretion of the product provider. It is generally accepted that discretionary benefits and charges should not be too dissimilar from those customers were led to believe that they would receive when they entered into the contract or transaction.

There is no precise method of defining what customers were led to believe at the inception of a contract, but it is generally accepted that the main influences on policyholder expectations are:

- statements made by the provider, especially those made to the client in marketing literature and other communications
- the past practice of the provider
- the general practices of other providers in the market

The management of the closed fund and the fair distribution of the surplus will be of vital importance. There will, however, be no need to consider any issues relating to new business as there would be for insurance companies still open to new business.

The company will, however, need to ensure that policyholders, particularly those in good health, do not lapse their policies.

The commitment may be needed to increase the confidence of other stakeholders.

The commitment may have been made in response to previous problems which led to the company being closed to new business.

Regulation may require this commitment to be made.

(iv) There are many possible reasons for the reduced bonuses and the company will bring out the relevant points in its reply. Some will be related to being in a closed fund but others will be more general.

The company will need to explain that although policyholders taking out with profits policies will expect to receive bonuses on their policies, these are not guaranteed..

Any bonuses will be from the surplus of the company and the extent of the entitlement is usually at the discretion of the company.

Bonuses will be lower than expected if the surplus is lower than expected. This could be for many reasons and the company will need to explain all that apply in this case.

The investment return could be lower than expected. This may be due to a fall in investment returns due to the collapse of the market or due to investment choices which turned out to be poor or inappropriate. It may also be because different assets now need to be held appropriate for a closed fund and these may give lower returns. The regulator may restrict the types of assets available for investment again possibly giving a lower return.

Expenses could be higher than expected. Although there are no new business expenses, the renewal and claim expenses will be expected to increase due to diseconomies of scale. Expenses may also increase if inflation is higher than expected. There may also be additional closed fund expenses.

Mortality may be higher than expected. This may be because some healthy lives are lapsing their policies. It may be because the mortality assumptions used were not appropriate or the underwriting not rigorous enough.

Lapses may be higher than expected. This may affect mortality as discussed above. It should not affect surplus if surrender values are calculated to ensure there is no loss to the company. If, however, there is a guarantee then this may reduce the surplus.

The bonuses could also be lower than expected if the amount of surplus available for distribution has changed for other reasons. The company may need to set aside some of the surplus as margin for any future adverse experience.

The company may need more capital and deferring the distribution of profit may have been used as a source of working capital.

With profit premium rates will contain margins designed to generate profit for distribution. There will be years where the amount distributed is lower than the amount generated due to the smoothing process.

The policyholders are likely to have expectations as regards to the form of the profit distribution and the level of bonuses.

They may have been led to expect much higher bonuses. The agents may have been guilty of mis-selling these policies.

Refer to bonus falls that have occurred in other WP funds (if this is the case).

The company could also provide details of what to do next if not satisfied with the response e.g. involve regulator or ombudsman.

There was a wide range of scores on the question. Better candidates picked up on the specifics of the question, for example in (i) that the data would have been collected through the agents, and in (iv) that bonuses have fallen and that the company is closed to new business.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

27 September 2011 (pm)

Subject CA1 — Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all six questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 (i) State what is meant by the term "statutory role" when referring to the work of an actuary, and state what statutory roles for actuaries mainly relate to. [2]

(ii) Set out what an actuary might be required to certify when carrying out a statutory role. [3]

[Total 5]

2 (i) Define the term "compulsory insurance". [1]

(ii) List four possible distinct types of compulsory insurance. [2]

(iii) Discuss, for each type of insurance identified in (ii), why it might be compulsory. [8]

[Total 11]

3 An insurance company writes regular premium with profits endowment assurance business. In recent years, there has been an economic downturn and many policyholders have been struggling financially.

(i) Describe the options the company could offer to policyholders who are unable to meet the full premiums due under their policies. [7]

(ii) Discuss how these options might differ for term assurance policies. [4]

[Total 11]

4 A retailer owns a chain of 15 stores selling high value, fashionable clothing and accessories. The chain's target markets are young, professional females. Most of the stores are located in and around the capital city of a developed country

(i) Suggest why the profits of this retailer may be volatile. [3]

(ii) Suggest adjustments that could be made to the retailer's business model that could reduce the volatility in profits. [3]

Following a run of several successful years, the retailer proposes to expand its operations significantly. This proposal will involve more than doubling the number of stores and the number of staff employed. The expansion will be restricted to the domestic country. The retailer has built its reputation on having highly knowledgeable and reliable staff, and is concerned that the expansion may compromise these standards.

In order to attract and retain the best staff and keep staff turnover as low as possible, the retailer has asked an insurance company to devise a savings scheme for employees that will encourage staff loyalty. This scheme will be in addition to the existing pay, bonus and benefits structure.

(iii) Describe possible features of the savings scheme that could help to achieve the retailer's objectives. [7]

At present, the retailer does not provide pension arrangements for its employees. Employees are expected to rely on basic state pension provisions. The government has announced that it will introduce a new legal requirement for employers to make some provision for employees' pensions. The retailer is considering two alternative methods that will meet this requirement – neither of which will affect the employees' basic state provision:

(a) Increase gross pay by a "pensions supplement". Employees will be encouraged, but not required, to invest this supplement in a pension plan provided by an insurance company.

(b) Both employer and employee contributions will be paid into a state top-up pension scheme. Contributions and the associated benefits are expressed as a proportion of basic salary and are set by the government.

(iv) Discuss the advantages and disadvantages of each of these alternatives from the point of view of the employees. You do not need to consider any individual arrangements that some employees may already have. [11]

The retailer has identified that maternity and paternity provisions cause a significant cost and disruption to its planning. It is worried that the expansion will exacerbate these problems.

(v) Outline measures the retailer could take to lessen the impact of these difficulties. You can assume that all reasonable actions would be legal. [5]

In order to finance the expansion, the retailer is proposing to issue a five-year conventional bond that will pay interest annually. Currently, yields on similar government bonds in the retailer's domestic country are 5% p.a. However, yields on such government bonds in a major overseas country are only 2% p.a. The retailer believes that by issuing the bond in the currency of this other country, it can cut its borrowing costs.

(vi) Explain why yields on the respective government bonds may vary. [3]

(vii) Describe the risks faced by the retailer if it issued such a foreign currency bond. [6]

[Total 38]

5 (i) State the components of both the expected and required returns on equities. [1]

An investment consultant has argued that equities should provide investment returns that are consistently above the level of national earnings inflation, and that they are therefore suitable investments for funds that have real liabilities.

(ii) Discuss the validity of the consultant's arguments. [8]

A government has recently announced its intention to change the measure of inflation it uses for its inflation target. The new measure of inflation to be adopted has typically been lower and much less volatile than the existing measure. This new measure will be used for:

- State benefit revaluation and public sector pay awards
- The setting of short term market interest rates

(iii) Explain why these two uses may have opposite effects on the rate of inflation actually experienced by consumers in the economy. [3]

(iv) Describe how the prices of domestically traded equities may develop in the short term following the adoption of the new inflation measure. [2]

[Total 14]

6 (i) Outline how the two key objectives for managers of specific investment funds could influence risk budgeting for a particular asset portfolio. [2]

(ii) Explain how, when using a top down approach, the total risk budget for a portfolio of assets could be monitored in terms of strategic risk, structural risk and active risk. [7]

(iii) Describe the different approaches to the managing of the systemic risk and the diversifiable risks within an equity portfolio held by a large insurance company. [12]

[Total 21]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2011 Examinations

Subject CA1 — Actuarial Risk Management

Paper Two

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, but better than Paper 1. As in previous diets, questions that required an element of explanation or analysis, such as Q4(vii) and Q6(iii), 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 (i) A statutory role is a role that can only be taken by an Actuary, as required by legislation.

The statutory roles for actuaries mainly relate to the certification of the adequacy of the valuation of assets and liabilities for a life insurer, general insurer or pension scheme.

(ii) Certification requirements could include:

In his or her opinion proper records have been kept for the purpose of the valuation of the liabilities.

Proper provision for the liabilities has been made.

The liabilities have been valued in accordance with any legislative rules setting out the method and assumptions for their valuation.

The liabilities have been valued in the context of the assets, which in turn have been valued in accordance with the appropriate rules.

In his or her opinion the premiums/contributions for future years will be sufficient, on reasonable actuarial assumptions,

and taking into account the free assets of the provider to enable it to meet its commitments in respect of the contracts written, or pensions promised.

A statement of the difference between the value of the provider's assets and its liabilities.

That he or she has complied with professional guidance notes.

This should have been a straightforward bookwork question as a good start to the paper but a disappointingly small number of candidates scored highly on this one.

2 (i) Compulsory insurance is where there is legislation requiring certain individuals or organisations in certain circumstances to take out insurance cover.

(ii) The main types are likely to be:

- Employers' liability insurance
- Third party motor liability insurance
- Medical insurance (including long term healthcare)
- Civil aviation insurance
- Product liability
- Life insurance cover for a mortgage or other large loan
- Professional indemnity
- Public liability

(iii) **Employers' liability**

To ensure that employees will be adequately compensated if they suffer illness, injury or death during the course of their employment.

Insurance is required because an employer may not have the financial resources to fully compensate an employee where injuries are serious.

The significantly reduces the likelihood of the costs from such injuries falling back on the state or causing serious hardship for the employee.

Third party motor liability

Motor vehicles can cause very significant damage to a wide range of both property and individuals.

Individuals are unlikely to have the financial resources to compensate those they cause loss to. Particularly as there is the potential for very large losses.

A legal minimum compulsory level of cover is used to ensure that those suffering losses can be compensated.

Again, without such cover, the state would have to pick up the cost or individuals would suffer hardship through no fault of their own.

Medical insurance

To cover the cost of treatment should a person become ill or have an accident.

The aim would be to ensure that the whole population has access to adequate medical care i.e. as a top-up or an alternative to state provision.

Compulsion can also be used to oblige employers to contribute to their employees' medical costs rather than relying on state provision.

It can also be set up so that, in effect, the better off subsidise the medical costs of the less well off.

Civil aviation insurance

This provides third party cover, passenger cover and cover for risks of war and terrorism.

Aeroplanes can represent a significant risk to both passengers and third parties in the event of an accident – given the large number of individuals potentially involved in one incident.

Because of this possible impact, they can be deliberately targeted in war or by terrorists.

The airline operators will not have the resources to fully compensate those affected and so a minimum level of insurance cover will be needed to cover such costs.

Product liability

Some companies e.g. pharmaceutical manufacturers supply products that can be harmful if used inappropriately.

Similarly, many products could be dangerous if manufactured negligently or with a defect – e.g. electrical goods.

Given the large number of potential consumers that could be affected and the level of damages that could be due to any particular individual, manufacturers could be put out of business by claims for liability.

Hence, compulsory cover is required to protect the general public and any burden that may fall on the state.

Life cover on a mortgage

Housing costs can represent a significant outgoing for many people both in terms of debt owed and servicing costs.

Should the main earner in a household die, their dependents may not be able to continue with loan repayments or payoff the debt outstanding.

In such circumstances, affected people may become homeless or have to rely on substandard or state accommodation.

Hence, compulsory cover is required to protect potentially vulnerable members of the general public and any burden that may fall on the state.

Cover may also help the banking sector in times of declining house prices. Requiring compulsory insurance (not just against death) from borrowers may prevent severe losses if mortgage defaults rise markedly.

Professional Indemnity

Many individuals or organisations rely on professional advice when making important decisions or taking important actions.

The financial consequence of poor or negligent advice could be very serious for those affected.

Many professionals operate within structures (e.g. partnerships) where capital available to pay compensation is limited.

Hence compulsory insurance ensures that those affected will be adequately protected.

Compulsory insurance may be a way that the authorities can attract a greater share of professional services business to their markets ie more clients if they feel more secure.

Public Liability

Many individuals or organisations carry out their affairs in such a way that they have a de-facto duty of care to members of the public.

In particular, their activities (or those of entities they are responsible for) can be responsible for causing death or injury to members of the public.

Such events could be numerous (e.g. local authorities) or have significant financial consequences.

In many cases, the parties judged to be at fault will not have the resources to provide adequate compensation. Hence compulsory insurance will be needed.

In particular, such insurance may protect taxpayers from the costs of dealing with claims if public bodies are involved or if other burdens fall back on the state.

On part (i), most candidates got full marks but some lost easy marks by not being thorough enough. The examiners look for candidates to be precise with pure bookwork and get the legislative angle.

Part (ii) was answered well, with a large number of insurance products to choose from, though just saying motor or product liability wasn't enough to score full marks.

On part (iii) better candidates explained what cover was provided and why, and extended answers to discuss what problems would arise/consequences of the event occurring and insurance not being in place.

3 (i) The policy could be made paid-up.

Premiums would cease but the policy would remain in force.

On maturity or on death before the end of the term, the policyholder would receive reduced benefits relative to those originally offered

Alternatively, the policy could be surrendered.

The policyholder would receive an immediate cash sum and the policy would be cancelled with no further benefits due.

The cash sum would normally be calculated as the current value of the paid-up benefits outlined above.

But, especially for surrenders a short time after inception, the surrender value may be based on premiums paid (possibly with interest). The premiums paid calculation may, in general, act as a guaranteed surrender value.

Other options may be available in certain circumstances.

The insurance company may agree to the policyholder paying reduced premiums with correspondingly reduced benefits.

Premiums could be deferred. That is stopped for a period and recommenced. Missed premiums could be lost or caught up later. Benefits would again be adjusted depending on the nature and amount of the missed premiums.

The policy could be converted to without profit.

The policy could be converted to life cover only.

The insurance company may agree to provide the policyholder with a loan using the projected policy proceeds as security.

The policies are with profit and so some allowance will be needed for bonuses.

This will include both bonuses already declared and potential future bonus declarations.

The treatment will depend on the split between reversionary and terminal bonuses.

(ii) The treatment will differ primarily because:

Term assurance policies have no savings element (and there is no certainty that benefits will be paid) and so reserves are not built up.

Hence, if premiums were to cease, it is unlikely that any benefits (paid-up or surrender) would be due.

They tend to be without profit – so no premium is being set aside to fund future bonuses.

In effect, each year's premium is the expected cost of providing the death benefit over the year. So all the premium is used up in providing next years' benefits.

There is also the need to cover expenses (which are relatively high given the low premiums) and a market tradition of using any surrender profits to fund expenses or higher death benefits.

The market for term assurance policies is often very competitive. Hence paying surrender or paid up benefits may further erode margins.

However, if the terms were very long or were taken out at older ages i.e. where mortality rates increase a lot over the term, then benefits may be payable.

In effect, the early premiums more than cover the cost of providing the early years' benefits and so a fund is being built up – these policies are getting close to whole life policies where a benefit will ultimately be paid hence it will be provisioned for.

Reduced benefits for reduced premiums would be a possible option. However, this request might be a sign that the policyholder was in better health than previously thought – so reducing the premium reduces profit potential (but better this than a lapse e.g. if another company would charge less).

The company would be wary about deferring premiums. Any wish to reinstate may reflect a deterioration in health and so may require underwriting or a higher premium rate.

Part (i) was fairly well answered – higher marks were gained for explaining what would happen to both the premiums and the benefit payments under each option. The question asked for description and many candidates just stated surrender or stop premiums without explaining what that meant. Some others repeated the same point in many different forms.

On part (ii) few candidates scored well. Many candidates failed to discuss why term assurance is differed in terms of lack of savings element etc.

4 (i) Profits are likely to be volatile primarily because sales are likely to be very variable.

Their products could be viewed as non-essentials or luxuries. Hence demand could fall (or rise) a lot depending on economic conditions

Likewise, they have a narrow target market and so are exposed to good or bad times for these customers.

Their stores are concentrated in a small geographical area. So again local economic conditions will be significant.

Irrespective of economic conditions, their products are subject to sentiment or trends. These fashions are hard to predict. If they stock the right products they could do very well and vice versa if they make mistakes.

But even if they get it right one year, there is no guarantee for the next year since fashions will change very quickly.

Unpredictable events e.g. weather or competitor action could mean that projected sales are not made (e.g. stock out of date or needs replacing).

Being a small company, they are exposed to problems with suppliers. For example there could be difficulty in getting stock, quality control or bad debts – they are not treated as well as bigger retailers.

Other cost type issues could come into play e.g. reliance on a few key staff, vulnerable to rent increases, high fixed costs or shifting patterns of good retail sites (transport issues say) or even fluctuations in raw material costs.

(ii) The key to reducing volatility in profits will be to stabilise demand for its products.

This will probably involve diversification.

But it will also involve altering the nature of the products it sells. There is little point in diversifying into products that are highly correlated to the existing range.

For example, they could sell menswear or children's clothes as well – both markets are less volatile.

They could target a wider range of female customers by for example being less "fashionable".

They could sell more basic or essential products where demand is less reliant on economic conditions. These tend to be lower margin, higher volume products.

Extending the product ranges e.g. away from just clothes may help since exposure to a "mistake" is reduced.

Moving into online sales may diversify the customer base.

Offering incentives or loyalty schemes for customers may smooth out fluctuations in sales.

Controlling relative wage costs say by moving to a more commission based package may reduce the impact of fixed costs.

It may be possible to diversify suppliers or improve existing locations. Likewise entering longer term arrangements or contracts where risks are shared may help.

(iii) The aims are to get good staff and to keep them.

Hence any scheme will need to offer a benefit to employees that should be linked in some way to performance and should provide benefits that are more favourable to long-serving employees.

However, employees shouldn't have to wait a long time for benefits to be apparent or payable – otherwise the scheme will not look attractive.

Any scheme should be simple and easy for employees to understand.

It should compare favourably with schemes offered by competitors to their employees.

A savings scheme implies employees will be expected to contribute. But to be attractive, employer contributions will also be needed.

In order to encourage long service, these employer contributions could be staggered in some way.

For example, employer contributions could start off at a low level then increase after say 3 years and then increase again after say 6 years.

Alternatively, employer contributions could stay fixed but bonuses be credited after certain service anniversaries.

They could be linked to employees' contributions. That is, the more the employee pays, the more the employer would pay.

In order to encourage performance, contributions or bonuses could be linked to profitability.

This could be done on a company basis or in relation to individual targets for each employee or store (so as to encourage teamwork).

To target the scheme on "good" employees, some form of waiting period may be incorporated.

In order to be eligible, employees may have to complete a probationary period, reach a certain grade or pass a test/review.

Likewise to remain eligible, certain performance standards should be set eg from an annual assessment.

There could be a penalty on early leaving e.g. removal of part of the fund relating to employer contributions.

It is likely that the benefits will be in the form of an accumulated fund with interest being added. This will reduce risk and volatility – enabling employees to have flexibility over when to withdraw funds.

This is because the arrangement is still likely to be relatively short term e.g. with a minimum period before funds can be withdrawn – flexibility over when and how much can be drawn down/reinvested will be attractive.

Returns could be expressed in the form of a guaranteed rate – say fixed for a few years or a lower rate but with bonuses depending upon investment performance.

In any event, returns are likely to be a lot better than the individual could get via a personal arrangement.

Or the scheme could be share based allowing employees to acquire equity in the company – this could encourage staff loyalty and retention.

To increase attractiveness, discounts could be offered on other insurance company products or say better death in service benefits provided.

The scheme should be set up so as to maximise any incentives or tax breaks offered by the authorities.

(iv) **Salary supplement**

The employee will receive an increase in take home pay.

However the top up may be taxed. Hence any pension provision made from it may not be tax efficient.

In theory, the employee has flexibility in choosing the nature of benefits and the particular provider.

This may appeal to employees who want non-standard benefits e.g. no spouses' benefits or early retirement.

But such flexibility (even with a recommended arrangement) may come with associated hassles for the employee e.g. time involved with admin. They may also not have the expertise to choose correctly.

However, employees who change jobs may not be able to maintain any arrangements since the top up may no longer apply. Also charges on a personal arrangement could be relatively high.

It is unlikely that any arrangements (including the recommended one) will provide benefits linked to salary – they will probably be defined contribution. That is uncertain future benefits.

Alternatively, the employee could join the plan with the insurance company. The attractiveness of this will depend on what "encourage" covers.

In particular, the employer is effectively contributing but will there be any incentives for further contributions say from employees or for the use of the pay rise for pension purposes – e.g. tax breaks?

If such encouragement means better value for money (e.g. lower charges, ancillary benefits) or includes flexibility (e.g. on changing employment – new employer contributions allowable) then the option may be attractive.

Alternatively, given that we have a small employer and an effectively voluntary arrangement, any such benefits may be limited – just a dressed up personal arrangement – possibly with limited flexibility.

There could be a temptation to use the net pay rise to contribute to the savings scheme. This is all well and good as the employee gets a double benefit.

The employee simply could spend the extra salary or repay debt

This may mean they end up with relatively low retirement benefits.

This may not be an issue if the benefit system provides a disincentive to save (offsets, means-testing etc.).

However, the extra salary per-se could have implications for existing benefits e.g. tax credits.

Government top up scheme

The employee will see disposable take home pay fall.

But explicit employer and employee contributions are made. In effect employee contributions are compulsory whereas above they were voluntary.

As employee contributions are likely to be taken from pay, they may attract tax relief or be otherwise tax efficient.

The benefits are linked to salary hence there is some certainty for employees.

However, benefits are linked to basic salary. Hence employees with large elements of non-basic pay (commissions, overtime etc) may end up with lower than expected benefits.

It is likely that the terms of the benefits will be very prescriptive (e.g. spouses' benefits, retirement ages, pension increases) – so reducing flexibility.

Payments from the government are likely to be very secure in that they will be made.

But, partly as a result of this, the effective returns employees receive could be relatively low.

In particular, the government may change the terms for future (or even past) service to the detriment of employees.

The effect of extra contributions should mean that employees receive relatively higher retirement benefits (ignoring means-testing).

The arrangement will probably be available for a wide range of employers and so may still apply if employees change jobs and the mechanics are the same for all employers – i.e. less confusing for employees.

However, a large bureaucracy will be involved making mistakes more likely and their correction more difficult.

In theory, this arrangement has cross subsidies. In particular, unless contributions or benefits are age dependent, older employees will get a worse deal.

(v) The problems for the company will be due to the loss of staff for a period and the costs of covering for them (e.g. paying twice for the same job). In addition, there is uncertainty as to when/if the affected staff will return to work.

The easiest way to reduce the cost would be to reduce pay of those on maternity or paternity leave. For example say ¾ pay for six months and then ½ for the next six months.

It may also be possible to suspend contributions to the savings scheme or pensions arrangement.

In many countries, the state may provide statutory maternity pay albeit at a low level. If so, the company may decide just to pay that (and reclaim it from the state).

However, this would still involve disruption.

Creating a good working environment where staff communicated with management, may give management more information and make it easier for them to plan pre maternity leave.

Another option may be to try and encourage staff to return to work as soon as possible. For example, by paying towards childcare costs or permitting flexible working. Creches may be impractical for this employer but may be viable because of the geographical concentration.

To cover the absences, the company may have a pool of "floating" workers (possible here due to the concentration of shops and transferability of skills from shop to shop). These workers would move from shop to shop covering any absences e.g. due to sickness or as staff leave.

In this way, the company avoids the costs of recruiting temporary staff who may not be as motivated or as good as permanent staff or may not be available as desired e.g. in senior roles.

Regular communication with the absent employee will help reduce uncertainty. That is, showing a caring attitude may encourage the employee to return earlier and will help with planning.

The crudest approach may be to use recruitment or promotion methods. By not employing people likely to want maternity leave or restricting them to lower grades say on relatively few hours, costs could be controlled.

Such a policy may be extremely difficult to implement unless very restrictive criteria are used, or even illegal or cause bad PR. It is also likely to conflict with the aim of attracting good staff i.e. the best staff maybe the ones thought of as being most likely to take leave.

(vi) The yield on a conventional government bond can be expressed as risk free real yield + expected inflation + risk premium.

Traditionally, government debt was viewed as risk free (in terms of default). However, there could be worries over the ability of the domestic government to make repayments hence a significant relative risk premium could exist (e.g. Greece, Italy …).

Other elements of the risk premium include IRP and/or a low marketability premium. For short-term government debt, these are unlikely to be significant. But under extreme circumstances they could be an issue (mark for either both not needed but only 1 mark overall).

Differences in the expected rate of inflation over the relevant term are likely to be significant influences. That is, the major economy is expected to have lower inflation over the next 5 years.

It is possible that different yields pertain to different economies due to supply and demand factors. For example the need to fund a budget deficit or regulations requiring investment in government debt could apply.

Both the above points are likely to tie in with expected currency changes. Lower returns will tend to imply a stronger currency. In that higher yields are needed to offset currency devaluation and the inflation that often causes it.

(vii) The essential risk is that borrowing costs are higher than they would have been if they had used a domestic currency bond.

There is also the uncertainty over the ultimate cost in domestic currency terms. In that with a domestic currency bond, payments are known with certainty.

This centres on the currency risk. The company will need to make payments to lenders in a foreign currency, both coupons and final repayment of the principal. These future payments have an unknown cost in domestic currency terms. If the domestic currency devalues, the cost of repayments will increase in domestic currency terms.

All the company's revenue is likely to be in domestic currency. Hence there are no matching inflows that could offset the currency risk.

However, they may purchase supplies from overseas. If so, they may have some expertise in hedging currency risk (e.g. they need foreign currency to buy stock).

But it will be a lot more difficult and expensive to hedge bond payments over 5 years. For example, the terms of any hedge may reflect the bond yield differentials – so no net gain is expected.

The 3% difference in government bond yields does not mean that there would be the same yield differential on the retailer's bonds.

- the domestic government may have a low credit rating and so perhaps the retailer could issue domestic bonds more cheaply than 5%;
- or the overseas government may be particularly strong and so the retailer's bonds would have to yield much more than 2%

It is extremely unlikely that they will be able to issue the bond to domestic investors. Hence they will need to go to the major overseas market to find investors.

But it will be difficult for a small overseas company to attract investors in this market (e.g. a relatively small issue from an unknown company).

They will need to employ local contacts to market the bond, raise investor awareness and deal with the legal mechanics etc. This could be expensive particularly if regulations are complex or unfamiliar.

There will also be ongoing expenses for example in terms of communication and disclosure to investors. These expenses will probably be higher than under a domestic bond. All such expenses will increase effective borrowing costs.

For example, the company will need to buy foreign currency to make the repayments (and convert the initial funds raised into domestic currency). Fees and commissions will be payable.

From the perspective of overseas investors, the bond could be viewed as risky or at least, it will come with great uncertainty.

Hence, a significant risk margin over the low government bond yield will be needed to attract investors.

Likewise, there is likely to be a marketability premium in that it may be difficult to trade the bond.

The company also risks upsetting domestic contacts and markets. In that they will lose out on potential profits and so raising money in the future could be harder or more expensive.

Many candidates scored almost full marks on part (i), giving a good range of ideas as to why profits may be volatile, touching on both income and expenditure components.

Again part (ii) was answered fairly well – with most candidates who picked up on diversification scoring full marks.

On part (iii) many candidates made good attempts, however most failed to generate enough points to score top marks on this section. For those candidates who did mention reasons how the retailer could retain good staff via bonuses etc., many then failed to expand on this and explain how it could work.

Part (iv) in the main was done fairly well. Most candidates appreciated the key points and explained them well, though not many made a clear distinction between DC and DB, which meant that some obvious issues were missed. Some candidates lost out on the "obvious" marks e.g. take home pay falling/rising – possibly by assuming this is implied by the question.

On part (v) many candidates failed to answer or at least gave a very short attempt at an answer. Those that did gain good marks were those that did not just think about reducing pay but also about how the company could work with the employee to make the arrangement more hassle free and encourage early return to work.

Most candidates answered part (vi) well.

Part (vii) was often the weakest part of the question. Some candidates just recited bookwork without expanding on points to explain the reasons for them. Many talked about currency risk – though few looked at volatility. Many answered from the point of view of an investor buying an overseas asset.

5 (i) Expected return on equities =

Initial gross dividend yield (d) + expected dividend growth (g).

Required return on equities =

Required risk free real rate of return + expected inflation + equity risk premium (ERP).

(ii) National earning growth could be expressed as:

Expected inflation + real earnings growth.

Assuming that we can equate expected and required returns on equities.

The expected return on equities will exceed earnings inflation if the risk free real rate of return + ERP exceeds real earnings growth.

Or from A above, if d + real dividend growth exceeds real earnings growth.

Typically, real earnings growth would be expected, over the long term, to be in line with real growth in GDP.

Likewise, over the long term, real dividend growth would be expected to be in line with real growth in GDP.

Hence, over the long term, we would expect returns on equities to exceed earnings inflation by the dividend yield.

Hence, over the long term, it would appear that equities would be suitable for salary-linked liabilities since higher salary growth would be compensated by higher equity returns.

But this link may break down due to short-term volatility. Lags or timing differences or periods where real dividend growth is relatively low may apply. Hence to say consistently is pushing things too far

Given that we would expect over the long term, earnings (and hence dividend) dividend growth to exceed inflation (i.e. real earnings growth is > 0), equities would also be suitable to match price-linked liabilities by the same argument as above.

In situations where volatility in equity returns would be a problem e.g. members of a pension scheme close to retirement, equities may not be suitable.

The above argument only really applies to growth in capital values i.e. where long-term fund growth matters e.g. terminal bonuses on with-profits insurance funds.

Many real liabilities will be of a cash flow nature.

Generally these will be inflation linked. Though some e.g. insurance company expenses could be earnings linked.

With such liabilities, suitability depends on having asset proceeds that match liability outgo over the short term.

Typically, much of the return from equities is in the form of capital appreciation i.e. dividend levels may be too low and/or volatile to match real liability payments.

Relying on being able to sell equities to cover income requirements will not be suitable given the short term volatility of equity prices.

However for some institutions eg those with strong positive cash flows, high free reserves or where cash flow liabilities are a small proportion of total liabilities, equities may be suitable for their real liabilities since volatility over the short term is less of an issue.

(iii) Lower public sector pay awards will reduce national earnings growth.

Lower public sector pay rises may also lead to lower private sector pay rises further reducing growth in national earnings.

Combined with lower state benefits, there will be reduced demand for goods and services (people have less to spend).

Costs for producers will, in general, rise by less than expected.

These factors will tend to reduce prices for consumers.

The new inflation measure is lower and more stable than the one previously used.

Hence it will be easier for the government to meet any given inflation target (e.g. 2% p.a.) without having to raise interest rates. It may also be easier to cut interest rates if desired without breeching the target

A lower than previously expected outlook for short term interest rates will be inflationary i.e. it will lead to higher actual prices.

This is because lower interest rates will tend to encourage borrowing, investment and consumption.

(iv) The initial factors are likely to be lower interest rates and lower salary costs for private sector companies.

Broadly speaking, these will be viewed as positive for equities and so initially, prices may rise.

The effect of lower consumer purchasing power will kick in later.

This will reduce demand for private sector products and services and so prices may fall as outlook for profits worsen.

Clearly there will be differences between different types of companies.

For example, capital-intensive companies that are not exposed to domestic demand may do relatively well.

Whereas service companies that rely on consumer spending may do badly as the effect of lower purchasing power will impact them most.

This will be especially true if they are labour intensive and/or they can't control payroll costs in line with the anticipated lower public sector pay rises.

On part (i) candidates who took care scored well, but this showed the importance of thinking through the equation e.g. "real" return rather than learning by rote.

For part (ii) very few candidates used the themes from part (i) as a helpful prompt. Those that scored well tackled each component of the question separately, giving clear structure – weaker candidates often commented only on the earnings link component and not on suitability.

Part (iii) was a very variable section – lots of good clear answers that scored full marks but many weak ones that missed the crux.

On part (iv) candidates in general did not give enough detail regarding the effect from both reduced demand and reduced costs.

6 (i) The 2 key objectives are ensuring security and obtaining high long-term investment returns.

A desire for security could:

Encourage a cautious approach
Lead to the choice of assets that follow a benchmark or target.

A desire for high returns could:

Encourage a move away from a benchmark.
Generally lead to more risk due to an active approach.

(ii) In this case, the 3 components of risk can be interpreted as:

Strategic risk: a mismatch between the liabilities and the strategic benchmark.

Structural risk: a mismatch between the aggregate of the individual (sector) benchmarks and the total fund (strategic) benchmark.

Active risk: stock selection risk by individual active managers moving away from the sector benchmarks in order to maximise returns.

In order to monitor the risk budget, returns on the benchmarks, the overall fund and the liabilities will be needed at regular intervals e.g. quarterly.

In addition, it will be necessary to check that the chosen benchmarks continue to be fit for purpose and represent what they are intended to do.

A top down approach means starting at the highest level i.e. the strategic benchmark.

The strategic benchmark should be relatively stable as it represents the long-term appropriate allocation.

Generally, it will be reviewed in conjunction with a significant change in the characteristics of the liabilities.

This could arise gradually or due to a large one-off event e.g. a bulk transfer out from a pension scheme.

Individual sector benchmarks will be reviewed more frequently.

For example the approach to risk within a sector may change (e.g. corporate as opposed to government bonds), the sector liabilities may change (e.g. terms of annuities) or new assets or even classes may become available/appropriate (derivative products say).

As sectors benchmarks are changed, it will be necessary to monitor the structural risk by looking at how the new combination of sector benchmarks compares to the desired strategic benchmark. This may lead to a further adjustment in the sector benchmarks.

The returns achieved by each individual manager will need to be monitored relative to their particular benchmark target.

Allowance will need to be made for any specific constraints applying to them in terms of how this would affect benchmark returns.

Looking at returns may help to monitor the active risk taken by managers but other qualitative approaches may be needed e.g. assessing portfolio make up and/or relative active money positions.

In order to do this monitoring, investment reports will be needed. In particular, we need the rationale behind the stock selection policy. This will help to assess the split between luck and judgement i.e. help as a guide to the future.

In addition to looking at the individual components, it will be necessary to monitor the combined overall risk budget across the whole portfolio.

(iii) Systemic risk is risk that affects an entire financial market or system, and not just specific participants

For equity investments, the risk of a decline in the stock market as a whole, with all stocks being affected, is a systemic risk

It is not possible to avoid systemic risk through diversification

As the insurance company needs to invest in equity (e.g. to meet customer's expectations, treat customers fairly, earn competitive returns etc.), systemic risk cannot be avoided. Nor would closing to new business be sensible

Systemic risks of the equity portfolio can be managed by

- Retaining the systemic risk:
    - The insurance company will have an established risk appetite
    - And will monitor its equity exposure to ensure the portfolio remains within the stated risk appetite

  - Allowing for this in the capital held by the company

- Mitigating the systemic risk:
  - By using hedging strategies for example

- Transfer/share the systemic risk:
  - The company could share risk with policyholders
  - By writing more with profit or unit-linked business
  - The company could transfer the policy book to another insurance company but this could be costly

The company could ensure that equities are not held in respect of guaranteed benefits.

That is a policy of asset liability matching could lessen the impact of systemic risk.

Diversifiable risks arise from an individual component of a financial market or system.

In the context of equity markets, diversifiable risk occurs when the price of an individual share falls.

The risk of a decline in the value of a particular security can be mitigated by an investor spreading the risk and investing in a large number of smaller holdings within each market and by covering a range of markets since the fund is not restricted to domestic equities.

In developed markets (e.g. UK or US), a portfolio of 30 to 40 shares will render the portfolio sufficiently diversified to limit exposure to systemic risk only.

Such a portfolio will need to cover a range of sectors to be efficient.

More shares would be required in developing markets because of higher equity volatility.

That is the impact of the movement of a particular share could be more significant.

Investment theories assume that a rational investor should not take on any diversifiable risk.

As only non-diversifiable risks are rewarded within the scope of most financial systems.

This implies that a passive or index tracking strategy should be followed.

However, the company may wish to aim for a particular level of exposure to diversifiable risk in following a particular investment strategy.

That is they may decide to follow an active management policy with the aim of beating a passive/tracking approach.

There will thus be a trade off between the diversifiable risk taken on and the projected extra expected return.

The level of exposure taken will be documented within the company's risk appetite and monitored in order to manage the risk.

The risk will also be factored into capital requirements.

The company could mitigate the risk through tailored derivative strategies.

Part (i) was disappointingly answered. The majority of candidates wrote down the two investment aims of return via risk and security encouraging caution, but did not extend this to how it would influence the risk budget.

In part (ii) most candidates picked up marks for explaining the three types of risk, but did not go into detail of how to set benchmarks or how to monitor each.

Part (iii) was possibly the weakest section of the paper with many candidates simply not getting beyond core definitions. This could be because this was the last part of the paper to be answered – there was a lot of evidence of time trouble. There were a lot of easy points here for fairly standard bookwork or natural application so it's important to give enough time to do it justice. Those that scored well went into detail on what the two types of risk were, then describing how to manage them.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

17 April 2012 (pm)

Subject CA1 – Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 Compare and contrast the following risk measures:

- value at risk (VaR) and
- tail value at risk (Tail VaR)

[7]

2 (i) Outline the functions of the money markets. [3]

(ii) Discuss the principal influences on the various short term interest rates prevailing in the money markets. [7]

[Total 10]

3 A solvency reserving basis requires that assets are valued at market value. Liabilities are discounted at risk free rates based on government bonds, with a best estimate basis used for other assumptions.

(i) Discuss how the adoption of this basis may affect the risks faced by an insurance company that writes single premium annuity business. [6]

A government has recently introduced new capital requirements for life insurance companies with the aim of increasing protection for policyholders.

It has been suggested that introducing similar requirements in respect of the funding levels of defined benefit pension schemes would give extra protection for schemes and scheme members.

(ii) Discuss the merits and potential difficulties of adopting this suggestion. [8]

[Total 14]

4 A group of neighbours living in a city have decided they would like occasional access to a car. They are investigating purchasing a car between them and sharing all the expenses of owning the car.

(i) List the expenses likely to be incurred. [3]

(ii) Outline how these expenses could be allocated between each member of the group. [3]

Car Club is an established company that has recently started operating in the city. An individual can become a member of Car Club by paying an annual fee and can then hire a car when needed on a pay as you go basis.

(iii) Discuss the relative attractions of joining Car Club compared with participating in the shared car purchase arrangement. [5]

Car Club is reviewing its insurance arrangements.

(iv) Suggest restrictions Car Club can put on its members to keep insurance premiums low. [4]

[Total 15]

5 A medium sized manufacturing and distribution company currently has no formal provisions for sick pay. The written contractual employment terms are that if an employee is unable to work due to sickness the employee will not be paid by the employer.

The company operates an informal, discretionary policy where, depending on circumstances and on the decision of their immediate manager, some employees do receive some sick pay. The level and duration of such payments varies and can be changed or stopped with minimal notice.

(i) Outline the possible rationale behind the company's existing arrangements for sick pay. [4]

The company is now proposing to introduce formal sick pay arrangements.

Employees who are absent due to sickness will receive full pay from the company for five working days without the need to produce evidence of sickness.

After that time, if certification of sickness from a doctor is provided, payments will be made as a percentage of full pay and the percentage will be as follows:

First three months 100%

Next three months 50%

Thereafter, payments will cease and no discretionary payments will be made under any circumstances.

(ii) Explain why the company's recent sickness experience may not be suitable for estimating future sickness experience and hence payments arising under the new arrangements. [9]

(iii) Set out difficulties the company may face were it to try to use any other sources of experience data for sickness rates. [3]

[Total 16]

6 (i) Define information asymmetry. [1]

(ii) Explain why there may be information asymmetry between an insurance company and its policyholders. [3]

(iii) Discuss how the information asymmetries arising in the following contracts could be mitigated:

(a) endowment assurance policies
(b) long term care contracts
(c) product liability insurance

[14]

[Total 18]

7 (i) Discuss how a portfolio of assets could be constructed to match liabilities. [4]

(ii) Outline why it might be important for an investor to select assets that match their liabilities. [3]

(iii) Discuss the extent to which the investments of a defined benefit pension scheme that is closed to new members and future accruals could be mismatched relative to its liabilities. [5]

A couple both aged 50 have four children aged between 10 and 16. They have been investing part of their resources with the aim of providing enough money to pay for university tuition fees for all four children. They have assumed that tuition fees in future will increase from the current rate in line with inflation.

A substantial change to university tuition fees has been announced for the following year. They will increase to three times the current rate.

(iv) Explain how this increase in fees may affect the couple's future financial planning. [8]

[Total 20]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2012 Examinations

Subject CA1 – Actuarial Risk Management

Paper Two

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

July 2012

General comments on Subject CA1

This subject examines applications in practical situation 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 candidates who perform best learn, understand and apply the principles rather than memorising the core reading.

The examiners set questions that look for candidates to apply the principles specific to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. Detailed specialist knowledge is not required and nor is very detailed development of particular points.

Good candidates demonstrate that they have used the planning time well – an attempt to understand the breadth of the answer required combined with a logical flow is a bid 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 April 2012 paper

The general performance was slightly better than in April and September 2011. Questions that required the application of principles or explanation, such as Q3 and Q7, 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 VaR and Tail VaR are both measures of risk but are calculated differently.

VaR assesses the potential losses on a portfolio over a given future time period with a given confidence level.

Tail VaR is defined to be the expected loss in a portfolio's value given that the loss is occurring at or below the *pth*-quantile.

Tail VaR gives information on the severity of failure whereas VaR gives no information on the losses in the tail.

Both VaR and Tail VaR are calculated from the same distribution of possible capital outcomes.

However, creating a distribution of capital outcomes involves some subjectivity, and often involves compromises, particularly around the tail of the distribution.

To get an appropriate VaR it is possible to focus on the particular area of the distribution (percentile) so that the compromises can be minimised over this range.

To get an appropriate Tail VaR is more challenging because it is necessary to have an appropriate distribution from the percentile for the Tail VaR onward throughout the extreme of the distribution.

A tail VaR is therefore much more dependent on areas of the distribution where there can be more compromises and greater subjectivity.

If the potential outcomes in the tail are very extreme then small changes to the tail can have a significant impact on the Tail VaR.

So Tail VaR is more complex to calculate and can also be more difficult to explain.

Due to the limitations inherent in Tail VaR, many people prefer the VaR measure.

Disappointedly answered. A surprising number of candidates did not understand these two terms, and the difference between them. The Tail VaR metric is dependent on the tail of the distribution an area where there is greatest uncertainty. It is important for candidates to appreciate the limitations and implicit assumptions underlying metrics used in the insurance industry.

2 (i) The money markets are dominated by the clearing banks who use them to lend excess liquid funds and to borrow when they need short term funds.

These loans and deposits are usually very short term, often overnight. Interbank rates are usually taken as the benchmark for short term interest rates.

Central banks, as lenders of last resort, provide liquidity to the banking system when required and also use their operations in the money markets to establish the level of short term interest rates.

Other financial institutions and non-financial companies also lend and borrow short term funds in the money market.

(ii) The central bank controls the shortest rate, typically the overnight rate, they are prepared to lend to the money market when demanded.

Other short term interest rates are agreed through supply and demand between money market participants, however, they are related or set relative to the shortest rate the central bank is prepared to lend.

The longer the short term interest rates, for example the 1 year rate, will reflect money market expectations for future short term interest rates over that period.

The expectation of the future short term interest rates will be influenced by:

- expectations of economic growth, for example interest rates being reduced to stimulate economic growth.
- expectations of inflation, for example interest rates being increased to reduce inflationary pressures.
- expectations for the exchange rate, the exchange rate is important affecting the cost of imports and exports and therefore relative competitiveness. Interest rates can be changed to help manage relative competitiveness, for example lowering interest rates to lower demand for the currency, lowering the exchange rate making exports more competitive.

Where the liquidity of the market is constrained interest rates may be bid up.

Where interest rates are bid up due to liquidity constraints the central bank may intervene to lend to the market to increase liquidity and lower interest rates.

Reasonably well answered. A number of candidates did not appear to know money markets typically covers short dated instruments from overnight to 1 year and missed the point that interest rates are agreed through supply and demand. Many candidates overstated the role of central banks in influencing money market interest rates compared with the fundamentals of expectation of economic growth, inflation and changes to exchange rates

3 (i) An annuity is a single premium policy where the benefit is a stream of payments to the policyholder, often dependent on their survival.

The annuity premium is usually invested in a mixture of government and corporate bonds. The investments are usually invested to produce cashflows that match the timing and amount of the benefit outgo.

Provided the assumptions made in calculating the liabilities hold over the lifetime of the benefit payments then there is no requirement to sell assets or alter the portfolio over the lifetime of the contract.

The financial risk can be divided into those inherent in the contract and those that arise as a result of the reserving basis.

Inherent in design of contract:

- The assumptions such as future longevity or expenses may be wrong resulting in additional benefit outgo, with no additional income from the assets.

- The assets may not perform as expected, for example the amount and timing of defaults on either corporate or government bonds different from expected.

Inherent in the reserving basis:

- Assets are valued at market values, whereas the liabilities are valued based only on the yield on government bonds. As the yields on corporate bonds and government bonds change relative to each other the market value of assets will change, however, only changes to the government bond yields will affect the value of liabilities resulting in a balance sheet mis-match between the assets and liabilities.

- This mis-match occurs despite the asset cashflows and benefits payments being cash flow matched.

- There is a financial risk that additional assets are required so that based on the reserving basis there are sufficient assets to meet the liabilities.

(ii) The capital requirements are likely to involve a solvency capital requirement. This will be a target level of capital below which the sponsors of the scheme may need to discuss remedies with their regulators.

The solvency capital requirement may be calculated using a prescribed model or an internal model. It is likely that any internal model would need approval.

This would initially appear to be a benefit for the members of a defined benefit scheme as it should increase the protection available. However, need to consider if the requirements are likely to lead to additional capital being needed and where will come from.

If from sponsor, this capital will no longer be available for the business and so this will have a negative effect on the company. This may lead to redundancies which will not be good for the employees.

May lead to a reduction in benefits from the scheme or to closure of the scheme – to new members or future accrual.

These capital requirements may not be needed as the relationship between an insurer and its policyholders is very different from the relationship between the sponsor of a benefit scheme and its members.

The DB scheme will have additional security due to the support of the sponsor.

There may already be a pension protection fund which will provide some protection for scheme members.

There could be a large impact on the market if these schemes are required to increase their allocations of risk free assets. There would be disinvestment from equities and corporate bonds to invest in more secure government bonds. This could lead to the schemes being forced to sell equities at reduced prices and to buy government bond at higher prices.

A defined benefit scheme will have liabilities linked to salary inflation and so equities may be more appropriate to match these liabilities.

This was the least well answered question on the paper. Many candidates did not appear to know that corporate bonds could be used to match annuities as well as government bonds. Many candidates therefore did not pick up the marks available from appreciating that the market value of corporate bonds will tend to be more volatile than corporate bonds that are exposed to changes in credit spreads and changes in credit rating.

4 (i) Initial cost of car this may be a capital sum or a monthly payment or a combination of both.
Car insurance
Car servicing costs
Car repair costs
Car licensing cost
Petrol costs
Car cleaning costs
Cost of any breakdown cover
Tolls, fines, insurance excesses

(ii) All the initial costs (capital sum, licensing, breakdown costs and possibly insurance) will need to be covered in full.

These can be split evenly between all the members of the group or they could be split by planned usage (may be fair if some members are expected to use the car considerably more than others) or by household size.

Any fixed monthly costs (payment for car or insurance) could be split in a similar fashion. Tolls, fines and insurance excesses could be paid by the individual who incurs them. The other costs are likely to relate to car usage.

These costs will need to be estimated and can then be split between the members of the group. This can be split according to mileage and/or the time the car is being used by a member (e.g. per hour). It will be necessary to have an initial estimate of mileage and time to calculate a suitable amount.

All members will need to have money available to cover higher than expected costs and/or shortfalls in the amounts raised by the above methods and this will be allocated between members in a similar way.

(iii) Under this arrangement, there will be similar items of expense, which will be covered in the annual fee and hire charges.

Car Club may be able to negotiate discounts on many of these items and so the relative costs may be lower. They will have a large number of cars and so will be likely to have more predictable costs. The cars may be in use more frequently and so the costs will be shared by a larger number of members. All of the above should lead to lower costs.

There may be additional costs of administration and profits to the provider which may affect this.

For a member of Car Club, all charges will be known in advance and their liability will be limited to this amount.

There will be no initial set up costs and no additional sums will be called for.

There may be more chance of a car being available at the time needed with Car Club. There may be more choice of vehicles with Car Club so useful if needs are not always the same e.g. may want occasional use of a very large car. The cars may, however, not be as conveniently located.

Members will not need to be concerned about where to keep the car when not in use.

(iv) May have an absolute minimum or maximum age limit.

There may other (higher) minimum age limits where drivers may be subject to additional restrictions e.g. at least two years since passing test.

Drivers may need to have a clean driving licence and to have had no (or only a small number) of accidents in the last five years and no criminal record.

Could charge a large excess to reduce liability and to encourage safe driving.

Cars may need to be stored in specific locations.

Cars must be locked when not in use.

All parts of this question were generally answered well with many candidates scoring close to the maximum available marks.

5 (i) The primary motivation will be to keep costs down.

If an employee was absent extra costs would be incurred in covering for them e.g. pay overtime or temps to do their job.

There would also be management time and costs involved in coping with problems caused by absences. Loss of production/revenue could also be an issue. Not providing sick pay would mitigate these extra costs.

It is possible that some employees regularly take time off when they are not really sick. This may be hard to prove and legislation may make it hard to discipline offenders. Not providing sick pay may cut down on such abuses. However, given the nature of the work (manufacturing) there may be many genuine sickness cases.

A discretionary arrangement will enable such genuine cases (e.g. people who generally have good sickness records or are injured at work) to be fairly dealt with.

Having flexibility over payments avoids long-term commitments, which could be abused and allows changing circumstances to be accommodated.

Immediate mangers may be best placed to make such decisions, as they will know the individuals and circumstances better than senior management.

(ii) Past, even recent, experience may not be a guide to the future. That is, will the data they have be typical and so a credible starting point. Over the recent past, there could have been abnormal experience. For example flu type epidemics or serious work related events – accidents or food poisoning say.

The company is not large and so there could be significant random fluctuations in experience. If economic times were hard, sick people may come to work due to fears over no pay or being dismissed – this will distort experience.

It is possible that general sickness experience is gradually changing. This could go either way e.g. better preventative care or worse diet, sedentary lifestyles. Changes within the company could be an issue. For example processes could have changed so altering experience. The nature of the company may have changed (or change in the future) e.g. is either manufacturing or distribution fairly new.

This highlights issues over a changing workforce e.g. by age, sex or other significant characteristic.

The company may not have adequate data to analyse and project experience e.g. just broad summary numbers of days off. It may not have data relating to sickness absence where no payments were actually made. However, the new policy will in itself alter future experience compared to past experience. This will be most significant for short-term sickness.

In the past, people with minor ailments may have come to work. Under the new policy, they are much more likely to take a few days off as they will be paid, no questions asked. Hence the use of past experience may seriously understate future sickness payments.

With longer-term complaints, under the old arrangements, employees would probably have gone sick. Hence the new policy may not distort such experience too much.

In addition, longer-term more clear-cut cases are where discretion may have been used to make payments under the old arrangements. So reducing the need to work when sick. But, depending on the level of discretionary benefits, there could be some distortion. For example, low levels relative to the new benefits may mean employees came back earlier than they would do under the new system.

Relatively generous treatment under the old system (long periods on full pay) may mean that employees were off sick longer than they would have been under the new policy. For example, the drops after 3 months under the new policy may lead to employees returning to work.

Under the new policy, certification is needed. Previously the whims of a manager mattered. So this subjective v objective difference will alter experience.

Different managers will have taken different approaches. Hence it will be difficult to say how experience under that regime will compare to a uniform approach.

It is possible that the distortions will vary by types of employees. For example, highly paid or motivated employees may not take dubious sick days even if paid – whereas lower paid employees in more physical jobs would. This pattern is also likely to vary a lot with age.

(iii) Other sources may be:

- Other employers
- Insurance companies offering sickness policies
- Industry wide data
- National statistics
- Overseas data

All these sources may not reflect the particular features of this employer.

This employer has a specific mix of employees. It is unlikely that other sources will match this – especially when lots of data is included e.g. hard to define an industry type.

Many sources may cover non or self-employed individuals. That is individual policyholders may have different experience to a group of employees.

This employer may be concentrated in a specific geographical location and sickness will vary by location.

Other sources may define sickness differently e.g. could be looking at critical injury or sickness satisfying statutory requirements.

Data from other sources may be out of date e.g. if statistics take a long time to compile or not detailed enough/in the right format. Even if sickness is defined in the same way, the nature of the benefits will affect sickness experience. Other sources may cover arrangements with different levels and/or forms of benefit e.g. in relation to the number of days before certification is required

Parts (i) and (iii) were answered well. Part (ii) was less well answered and required candidates to think about practical aspects, for example that changing the benefits available to employees will change their behaviour. The future experience may therefore be very different compared with past experience.

6 (i) Information asymmetry is the situation where at least one party to a transaction has relevant information which the other party or parties do not have.

(ii) There is a difference in expertise and negotiating strength between the two parties. This is made more significant by the fact that financial transactions related to insurance can have a significant impact on the future economic welfare of individuals.

Furthermore in most countries the majority of the population is not well educated in financial matters and find the range of solutions on offer complex and confusing.

There can also be information asymmetry when the prospective policyholder has more information than the insurer, for example information on their health.

(iii) Regulating the insurance market would reduce the information asymmetry which advantages the insurance company in (a), (b) and (c).

Consumer education could be provided which should help consumers to make informed financial decisions.

The insurance company could be required to disclose full information about its products or itself in an understandable form. This should give an indication of bonus policy which will be of use for (a) and also the terms of payment of benefits which will be of use for (b).

The weakness of an individual in negotiating a deal with a large institution may be addressed by price controls or the regulation of selling practices.

The customer's position can be strengthened by devices such as giving them the right to terminate the sales process at any time, or by providing a "cooling off" period, during which a consumer can cancel contract with no penalty.

(a) An endowment assurance provides a benefit on the death of the life insured within the term of the policy or on survival to the end of the term.

The earlier the benefit is paid out the more it will cost the insurer. This will depend on the mortality of the life insured over the term of the policy. The prospective policyholder will have more information than the insurer on this.

Mortality will be affected by the state of health of the applicant as well as family medical history, occupation, leisure activities undertaken, country of residence and possibly countries travelled to.

There will be additional information asymmetry if the endowment policies are with profits as the insurer will decide on the level of any bonuses payable. The policyholder cannot influence this. To reduce the information asymmetry from the endowment assurance the insurance company will underwrite the policy.

It will obtain evidence about the health of the applicant so as to assess whether he or she attains the company's required standard of health and if not what their state of health is relative to that standard. The level of evidence may depend on the sum assured and/or term of the policy.

It will also ask for details of the occupation of the applicant as well as any potentially dangerous leisure activities undertaken – in the recent past and planned for the future. It may also require details on the financial health of the applicant to counter the risk of over insurance.

(b) A long term care contract will start to pay out when an elderly person needs nursing-home or nursing care. It may provide a cash lump sum, an annuity to contribute towards the cost of care or pay all the costs of care throughout the remainder of life. The cost to the insurer will depend on when the benefit starts to be paid and how long it is paid for.

This will be affected by the state of health of the policyholder relating to the events under which the benefit will become payable as well as their mortality. The prospective policyholder will have more information than the insurer on this.

The insurer will be able to influence when the contract will start to pay out.

To reduce information asymmetry from the long term care contract the insurance company will need to underwrite the contract.

Health evidence will be needed but in this case it will be necessary to focus on aspects likely to give rise to the need for long term care. Family medical history may also be useful here.

Once the policy has been taken out, the policyholder may be more willing to receive nursing care or go into a care home so it is very important that the terms under which the benefit becomes payable are very clearly set out. There may be a minimum period before claims could be made. Claims control systems at the time of the claim will also be useful.

(c) This insurance indemnifies the insured against legal liability for the death or bodily injury to a third party or for damage to property belonging to a third party, which results from a product fault.

Here the perils depend greatly on the nature of the product being produced, but include faulty design, faulty manufacture, faulty packaging and incorrect or misleading instructions.

The company seeking insurance will know the full details and background of the product but the insurer will not. However, if the insurer specialises in product liability insurance, they may have much more expertise than their policyholders in this market.

The insurer will need to learn more about the product concerned. It will need information about how and where it is produced and the quality controls in place. It will also want details of any previous problems with this product or any others produced by the same company.

It will be very important that the company taking out the insurance still has an incentive to produce quality products. There may be exclusions on the policy if quality standards are not maintained. For the same reason, excesses are also likely to be useful.

Disappointedly answered. Most candidates correctly defined what an information asymmetry is, i.e. that an insurance company and policyholders will have different knowledge. However, in parts (ii) and (iii) many candidates failed to demonstrate that they actually understood in a practical sense what an information asymmetry is and how it can be managed. In part (iii) few candidates scored well and this appeared to be due to a failure of candidates to identify the different parties involved, their different knowledge and how this would influence their behaviour.

7 (i) A precise match will mean having a flow of asset proceeds that correspond perfectly to liability outgoings. In particular, it will be necessary to take into account the term and currency of the liability payments.

In practice, even for guaranteed or fixed liability outgoings, it will be impossible to find assets that give such a perfect match. This is because there will usually be some uncertainty over the probability of some payments being made (e.g. due to mortality fluctuations). Also, the terms of some liabilities may exceed the terms of the available assets required to match them. Techniques such as immunisation or liability hedging may be used to select assets that perform in the same way as the liabilities.

In the case of assets that are real in nature, matching is only likely to be possible at a very broad by nature level. For example, few, if any, assets provide proceeds linked to salary growth and proceeds on real assets are often very volatile.

The closest match may well be to have assets, that over the long term, are expected to provide proceeds (income or capital) that grow in a broadly similar way to liability outgoings.

(ii) The priority for many investors will be to meet their liabilities as and when they fall due. Having matched assets and liabilities will remove the risk of failing to meet this objective. In particular, it will remove risks relating to having to sell assets at unknown prices or reinvest proceeds on unknown terms.

Matching will be important for investors if the consequences of a mismatch are severe for example in terms of solvency of an institution.

Many investors will have low appetites for risk (or manage money on behalf of such investors). They will put an ability to meet liabilities above a desire for potentially high returns.

In many cases, regulations may implicitly or explicitly require matching. There may be penalties e.g. in terms of higher reserving requirements if assets are mismatched. Investors with low free reserves or other sources of income or capital are likely to view matching as more important.

(iii) In general, investors would mismatch assets and liabilities in order to generate higher returns relative to a matched portfolio. So there will be a trade off between the chances of higher returns and additional risks by having an unmatched position.

Much will depend on the level of surplus in the scheme. A high surplus will enable a more aggressive investment strategy i.e. less matching. However, given that the scheme is closed, it is unlikely that there will be significant surplus.

Worries about the cost of continuing the scheme may be behind the decision to close. So there may be little surplus to start with. Some of the surplus may have been used as part of the closure arrangements – to benefit the sponsor or members.

Given that a decision has been made to close the scheme, it is unlikely that the sponsor will want the risk of having to find additional contributions should a mismatched asset policy lead to losses.

There may be scope for some mismatching if some benefits are discretionary or can be altered. That is if any guarantees can be adjusted. There may be practical difficulties in altering benefits in this way depending on the terms of the Trust Deed and Rules and on member expectations.

If the scheme still has a high proportion of members who have not yet retired, there may be some time before many of the liabilities come into payment.

It is possible that the volatility associated with mismatching may not be too significant. However, as the scheme matures, it will be more important to reduce volatility and have a tighter match. As the scheme matures, it will decrease in size and so the opportunities to mismatch may reduce. Expenses associated with active mismatching may become more significant.

Regulations associated with a closed scheme may be more onerous and effectively prohibit mismatching. For example if benefits were reduced (to discontinuance terms) or if the scheme wants to qualify for help from protection funds etc, it may be a condition that a matching policy has to be followed.

(iv) The couple have been investing to match an inflation linked liability due to start payment in two (probably) years and to continue for at least nine years from this time.

The nature, term and currency of the liabilities are unchanged so the existing assets may still be held to meet one third of the new fees for each child.

The amount has however changed significantly and so the existing investments will no longer provide all the required capital.

The couple will need to consider whether it is possible for them to meet this new cost. Even if they cannot meet it fully they may still wish to increase the amount held for each child. They only have two years to save for the first child and so they may prioritise this in the short term.

They will need to consider any other existing savings or assets they hold and whether these can be made available. These may be suitable as they are or they may need to be changed. They will want low risk investments that will be available when needed to meet these liabilities. They may need to move any existing assets gradually.

If they currently make any other regular savings from their income, these could be redirected. They may be tempted to reduce pension contributions although this is very unlikely to be a sensible long term solution.

They can also take into account their future income. Is it possible to increase any savings they make from their income?

Expenditure could also be reduced to increase amount available for savings.

If they own a property this could be mortgaged to provide any shortfall in capital. This will need to be repaid, probably before retirement, and so may not be a realistic option.

They may also investigate alternatives. They may consider overseas universities either because of lower fees or increased chances of scholarships. It would then be necessary to consider currency in any investment strategy, although the currency needed may not be known in advance.

It may be possible for students to obtain a loan. If this was the case the parents could make the repayments on behalf of their children. This would be a much longer term commitment.

Parts (i) and (ii) were reasonably well answered. Part (iii) was less well answered, in part because answers were not specific on the scheme being closed to new members, and why the scheme may be closed to new members. Part (iv) the magnitude of the increase in fees was not taken into account in the answers.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

25 September 2012 (pm)

Subject CA1 – Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all six questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 (i) List the types of financial and non-financial risks that a provider of financial products faces. [3]

(ii) State the purpose of risk classification. [1]

(iii) Describe how risk classification can be used in the design and pricing of an insurance contract. [5]

[Total 9]

2 (i) Discuss the advantages and disadvantages of using market values for the valuation of the assets of a pension scheme. [4]

(ii) Suggest why using:

(a) smoothed market values
(b) discounted cash flow values

may not be suitable alternatives to market values for the valuation of assets of a pension scheme. [2]

It is three years since the last scheme valuation. The average annual return on the domestic equity portfolio of a pension scheme over the three years has been lower than half the average domestic equity annual return over the ten years prior to the last scheme valuation.

(iii) Suggest possible reasons for this relative fall in returns. You should consider both market and scheme specific factors. [7]

[Total 13]

3 (i) State the principles of investment. [2]

(ii) Describe how an institutional investor could use the Actuarial Control Cycle to develop an optimum investment strategy. [7]

An institutional investor is considering purchasing shares in an overseas company which owns a small fleet of private jets that are leased to individual and corporate customers.

(iii) Discuss the factors that could influence the attractiveness or not to the investor of the proposed share purchase. [7]

[Total 16]

4 (i) List the criteria that could be used to assess the viability of a capital project. [3]

A large, profitable life insurance company is looking to expand into new markets. At present the company sells term assurances, endowments and sickness policies. The sales director has just bought a cat and has suggested that the company enters the pet insurance market.

(ii) Discuss the issues that should be considered before entering this new market. [10]

The company has decided to enter the pet insurance market and has developed a project plan.

(iii) Describe the considerations the insurance company should take into account when choosing a suitable risk discount rate for the analysis of this project. [4]

[Total 17]

5 A country is proposing to introduce new technical actuarial standards to be followed by members of the national actuarial association.

(i) State what the main aim of these standards is likely to be. [2]

(ii) Outline when a departure from these standards may be acceptable. [1]

(iii) Set out how the following accounting concepts are generally interpreted:

(a) Accruals
(b) Realisation
(c) Cost
(d) Prudence
(e) Consistency [5]

Two insurance companies are based in different countries and each company only writes business in its home country. Different local accounting practices apply in each home country which treat the concepts in part (iii) differently.

(iv) Discuss the difficulties that may arise when comparing the statements of financial position and income statements of the two companies. [10]

[Total 18]

6 An individual aged 35 is considering the following options as ways of providing for his retirement needs:

Option A:

Take out a 30-year regular premium with profit endowment assurance policy.

Option B:

Take out a personal loan repayable over 30 years. The loan will be used to buy a residential property that the individual will rent out to tenants. The rental income will be used to make the capital and interest repayments on the loan. After 30 years, the individual will use the property as an asset to provide retirement benefits.

Option C:

Take out a series of without profit, deferred annuities each of which will come into payment at age 65. Every year, for 30 years, the individual will pay a single premium to secure a guaranteed prospective pension based on prevailing premium rates.

Discuss the relative merits of each option in terms of:

(i) likely tax treatment of benefits and contributions [4]

(ii) protection of benefits relative to inflation [5]

(iii) expenses and administrative complications [4]

(iv) potential benefits on death before retirement [4]

(v) potential flexibility if the individual wishes to retire early [5]

(vi) suitability of the nature of the benefits available on retirement [5]

[Total 27]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2012 Examinations

Subject CA1 – Actuarial Risk Management

Paper Two

Introduction

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

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

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

D C Bowie
Chairman of the Board of Examiners

December 2012

General comments on Subject CA1

This subject examines applications in practical situation 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 candidates who perform best learn, understand and apply the principles rather than memorising the core reading.

The examiners set questions that look for candidates to apply the principles specifically to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. 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 understand the breadth of the answer required combined with 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 proportional to the number of marks available.

Comments on the September 2012 paper

The general performance was better than in April 2012. All questions except question 5 were reasonably well answered. For questions requiring application it is important to go beyond making generic points to score well. 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 (i) Market
Credit
Business
Liquid
Operational
External

(ii) It is a tool for analysing a portfolio of risks by their risk characteristics. To split the risks into homogenous groups; where the risks within each group have similar features. This allows an appropriate price to be charged for the risk.

(iii) The first stage of risk classification in the design of a contract is an identification and documentation of the risk characteristics involved. To understand the level of risk within each contract.

For each risk it is necessary to decide for the contract those the provider is prepared to:

- take on and keep
- take on but lay off through the use of reinsurance or alternative risk transfers or underwriting
- refuse or eliminate unnecessary features

For those risks that are decided to be taken on and covered within the contract there is a decision required on the extent that the risk will be accepted.

Having decided on the risks to retain, the provider may change the product design to limit the risk in another way, for example restricting the risk by lowering cover levels, or tightening the circumstances when a claim can be made.

For the pricing of the contract it is necessary to translate the risk to risk factors that can be used to measure the frequency and severity of the risk so that the premium reflects the risk being taken on, i.e. that a fair premium is charged for each group.

Candidates scored very well on parts (i) and (ii), however, candidates struggled with part (iii). Part (iii) required candidates to relate the design of an insurance contact to restricting the extent that risks are accepted. Insurance companies structure the design, terms and conditions of a product so that they only accept the risks to the extent that they desire.

2 (i) The valuation method for the assets should be consistent to that used for the liabilities e.g. if the market value is taken for the assets then the liabilities should be calculated using a consistent rate.

The nature of the liabilities, heterogeneous benefits and scheme membership means that no "market value" is available i.e. there is not a liquid secondary market for trading existing pension scheme liabilities.

The purpose of the valuation is important. If it is to calculate the funding level e.g. for accounting or regulatory purposes or for a commercial transactions e.g. bulk transfers using market value is appropriate.

However, the market value is volatile in the short term which is an issue in setting a stable contribution level and may cause credibility problems.

If the scheme is a going concern the definition of market value used i.e. willing seller and willing buyer, should be consistent with the fact that the assets will not be immediately liquidated.

A misleading picture may be created, for example if the funding basis uses market values and funding levels are then quoted.

The main advantage is that the market value is readily available and also easily understood and communicated e.g. trustees. However there may be practical problems if no or multiple market values are available e.g. property or unquoted shares, no market value versus other assets which have more than one market value.

(ii) The smoothed market valuation will remove daily fluctuations but does not lend itself to consistent liability valuations.

Discounted cash flow allows consistency with the ongoing e.g. cash transaction liability calculation but requires more calculation and is hard to estimate future cashflows.

Neither may be an alternative if they are not permitted by local regulations.

Smoothed market values will not reflect drastic changes in the asset value i.e. if the company went nearly bankrupt and is subjective e.g. choice of assumptions and discount rates

(iii) **General market**

The whole economy is in recession.

There was a boom i.e. returns were very high for a period, rather than being particularly bad now.

There is currently a weak market and market values are low. This has been seen across all sectors.

The economic environment may have changed so all asset classes have lower absolute returns.

The growth in capital values has reduced and income streams are lower.

Due to the changing demographics there has been more demand for long term investments such as bonds. The type and/or term of investment has changed for example less equity demand due to lack of stability.

Poor political climate, uncertainty, riots, unemployment etc.

Unfavourable economic factors such as rising interest rates

Abundance of other investments, for example safer government bonds

Unstable inflation

New regulation due to banking crises so shift in investments

Tax and regulation with suitable examples e.g. removal of dividend tax credit?

Scheme Specific

A comparison of absolute returns achieved between different periods is not a good guide for how the investment manager has performed relative to their benchmark or peers. The investment managers may have had brief periods of underperformed in the prior 10 years, but out performed in the rest of the period,

The fund manager may have achieved higher returns by taking higher risk in the equity portfolio in the prior 10 years. Or the fund manager may have changed. Due to low funding levels the fund requires less volatile investments. To reduce the volatility the level of risk and therefore expected returns within the equity portfolio may have been reduced, for example lower beta equities, and sectors subject to less volatile returns, no unquoted equities.

The investment strategy has been changed for example from an active to a passive one i.e. tracking the market rather than taking risk for higher returns.

There have been regulatory changes. These have changed the way in which equities are valued. The new approach to valuing equities has reduced the returns compared to the previous valuation method (assumptions).

These changes have required that assets be disposed of and different ones purchased. This in itself incurs expenses but also may have been done at inopportune times. Possible crystallisation of capital gains tax due to changes in investment strategy.

All parts of this question were reasonably well answered.

3 (i) A provider (investor) should select investments that are appropriate to the nature, term and currency of the liabilities and the provider's (investor's) appetite for risk.

Subject to the above, the investments should also be selected to maximise the overall return on assets, where overall return includes both income and capital.

(ii) The initial starting point is the general commercial economic environment against which assets and liabilities are traded and valued.

i.e. The factors and conditions (such as economic, legal, political, and social circumstances) that generally affect everyone in an industry or market in more or less similar manner. Stakeholders should be considered, for example, trustees, employees etc and the impact on them. Specify the problem by having a clear objective for the long term asset liability portfolio.

The investor must be aware of what their investment objective is e.g. to match liabilities or to simply outperform a target. And also a clear identification of the risks that they are faced with.

This leads on to consideration of the assets available, including internationally and in relation to solvency/risk tolerances and whether any deviations are permitted.

In developing the solution consider the nature of the liabilities/target to match/outperform with the assets available to develop an asset liability model.

Devise a model using available tools e.g. individual expertise or software packages to select individual stocks, if active investment or indices to track if passive investment e.g. choose and update variables as and when changes occur e.g. returns, correlations, standard deviations, assets available.

At the same time must keep in mind the nature term and currency of the liabilities and/or risk tolerances/constraints of the institution.

Once built, test the model and feed back the results into the cycle with regular monitoring against the objective. The initial stage of this may involve back-testing the model against historical investment experience. There would also need to be regular on-going testing to react to changes in market conditions and expectations. Monitor and feed results back on an ongoing basis so that stakeholders are continually informed and can make decisions.

Are the assets still a match for the liabilities, that the indices are still appropriate and that the portfolio is still within risk tolerances so that the portfolio remains optimal.

This will involve monitoring solvency/funding levels and comparing managers against targets to ensure optimal performance achieved.

At all times act in a professional manner. This includes adhering to professional guidance, obeying Chinese walls and insider dealing rules, ethical/socially responsible investments and corporate responsibility.

(iii) **General**

The institutional investor will need to consider both the specific merits of the proposed investment and how this investment will fit within the overall portfolio. In particular the investor will need to consider whether to change the overall risk profile of the portfolio to accommodate the new investment, or if the overall risk profile is to be maintained whether a suitable rebalancing of the portfolio can be achieved to accommodate both the amount and nature of risk the new investment would generate.

Need to consider the current state of both the domestic and overseas economies i.e. recession, booms etc, and consider the needs of the investor, i.e. the returns required by the investor as well as diversification and restrictions.

If the domestic economy shows poor prospects compared to the overseas economy it may be viewed as an unsafe investment and, although possible lower returns, opportunities overseas maybe seen as safer investments.

Overseas may be better but likely more unstable inflation i.e. higher rewards often mean higher risks, including unstable investment markets and exchange rate risk, political risk, environmental risk.

Plus the issues of language barriers, tax, timing differences, accounting differences etc., all of which lead to extra expenses.

Diversification issues, manage domestic and overseas exposure.

Likelihood of economic growth in the domestic market is low.

Specific

Non performance of the lease. The overseas company could default on the shares. This is compounded by the overseas issues, i.e. higher gearing if there is too much debt and will not attract investors.

The residual value of the aircraft at the maturity of the term. This is not as volatile as share prices nor as subjective as property. In general there is a guide to the price of the aircraft at various ages, tweaked to allow for cosmetic and engineering issues.

This is a luxury goo, which is a cyclical market i.e. demand decreases in times of recession.

Mobility of the asset means that there could be no residual value i.e. there is the political risk that the owner could fly the aircraft to a political neutral country to avoid repayment.

Will need the help of specialists in valuing the asset.

Residual values and hence share values will depend on the maintenance of the aircraft, the upkeep depends on the quality of the operators i.e. record keeping, maintenance, rogue operators could devalue the value of the shares.

State of registration, the aircraft i.e. the asset need not necessarily have been registered locally hence more complications and susceptibility to political risks. There is susceptibility to local regulations.

Depends a lot on the terms of the leases if based on very lucrative terms could lead to large returns on the shares and provide a large amount of diversification.

The extra risks will be covered by the Equity Risk Premium otherwise the investor will not proceed with the investment, e.g. the company could default on shares if they are highly geared.

Overall this was the best answered question on the paper.

4 (i) **Financial**
NPV
IRR
(Discounted) payback period

Other
Achieving synergy/compatibility with other projects undertaken.
Satisfying political constraints both within and outside the sponsor.
Having sufficient upside potential or not too much downside.
Using scarce capital and resources (if available) in the best way.

(ii) Before developing a detailed plan or progressing to a feasibility study an initial high level assessment should be undertaken to consider whether the proposal warrants a more detailed analysis. The insurer would then be expected to commit a relatively small amount of capital to develop a feasibly study (including high level financial impacts), high level plan, a project budget proposal. It this is approved the project would be initiated.

Project plan, milestones and conflict management Clear aim and time line with appropriate pace set.

Model design. Design of a new pricing model or adaption of existing.

Knowledge. Insurer's experience of writing different classes of business, or more especially access to information on morbidity and mortality of animals.

Interaction with other professionals. For example vets, lawyers, general insurance actuaries, stable but challenging relationships. Specialist underwriting may be required including the help of vets, animal behaviourists. So excellent communication and supportive environment is needed , all parties need to buy in.

Systems – develop new admin systems or are current ones flexible enough to be adapted, given can use the existing policyholder data base the existing system with a few tweaks should be fine, providing the existing system has flexibility.

Thorough testing at all stages with use of the actuarial control cycle.

Spread of different risks within the portfolio – thorough risk analysis. Risks will vary according to species type.

Likelihood of epidemics and new diseases and also the evolution of technology.

Legalities – discrimination amongst animals! Use of DNA tests that are commonly available for animals.

Demand – thorough market research to ensure that there is demand for this type of product.

Sales channel. Consider vets waiting room, pet shops and also pet food section of supermarkets. But more importantly the existing policyholder database.

Volume and mix of business – again through market research. Will have to include extra prudence due to the extra uncertainty. Here it is not the change in mix of business as this is a new market.

Level of investment, required return and level of free assets.

Emotional behaviour. The sales director has an emotional interest in the project. The initial planning go ahead stage must involve all senior management and brainstorm the suggestion.

Costs information. Obtaining the additional information and adequate allowance for prudence.

The underwriting of animals and to what level of underwriting. Consideration of whether to offer one level of cover, probably best initially and then extend to different levels once sufficient data has been collected. Also consider exclusions e.g. dangerous dogs, working dogs, livestock.

Initial level of cover to be offered. A new model will need to be developed and appropriate skill set will be needed, as part of the model will need to

design different levels of cover say just medical fees for routine vaccinations through to repatriation if overseas.

Speed. Unlikely to have the same urgency as getting life insurance in place.

Popularity. Increasing due to increase in vets bills and pet owners and also this is a niche market so there are a lack of competitors.

Reinsurance. The use of reinsurers due to the technical assistance and also the additional uncertainty with a brand new product. Also XOL insurance due to potentially large liability claims.

There will be less data available compared to standard life insurance contracts, vets are a more modern concept than doctors and less animals registered with vets than doctor.

There may be less questions on the proposal form to encourage take up but possibly decline more proposals.

The insurance policy extends into general insurance if third party cover is offered e.g. dog running in roads and causing car crash or damage to property also different industries for example the search for lost or stolen animals.

The range of illnesses is greater. Range of breeds and animals compared to one race of humans. Likely to start with common domestic pets such as dogs and cats. Could be expanded to birds and rodents depending on initial success. This is a niche market so therefore can build more margins for prudence into the premium.

(iii) The life insurer needs to consider the cost of capital i.e. the cost of raising the capital to fund the project or the opportunity cost of capital for not investing in another project. Incremental cost of capital based on optimal debt to equity.

The normal cost of raising capital is the WACC, i.e. the reward for the shareholders or the cost of capital in real terms of borrowing debt capital.

That is, the margin over the total real return on index linked bonds, including an allowance for default risk and tax, and an additional allowance to compensate the equity investors for the extra risks and a possible inflation adjustment.

This is a large profitable life insurer and they are likely to have significant free reserves to use as capital, so in this case consider the expected return on long term equity investment.

There is likely to be a high discount rate set as this is a new project but this will lead to distorted results. Systematic risk will be higher due to the uniqueness of this project and this will be reflected in the risk discount rate.

Consider rates used on similar projects or even rates used by competitors, reinsurers or auditors may have produced benchmark surveys.

Although the NPV calculation is insensitive to small changes in the risk discount rate so it does not need to be precise.

This question was reasonably well answered. A number of weaker candidates struggled with part (ii) and (iii) by not concentrating on the this being a project and following the normal steps.

5 (i) The main aim of the new standards is likely to enhance the quality of actuarial reporting (consistency) to ensure that users of actuarial information can have confidence in the relevance, transparency of assumptions, completeness and comprehensibility of the information.

The new standards should also promote the integrity, competence and transparency of the actuarial professionals.

(ii) Work may depart from the requirements of the standards if the departure is considered not to be material.

In this context, something is material if, at the time the work is performed, the effect of the departure (or the combined effect if there is more than one departure) could influence the decisions to be taken by the users of the resulting actuarial information.

(iii) (a) Accruals: Expenses are recognised as and when they are incurred, regardless of whether or not the amount has been paid.

(b) Realisation: Income is recognised as and when it is "earned". It is not, therefore, necessary to wait until the customer settles his or her bill.

(c) Cost: Non-current assets generally appear in the statement of financial position at their original cost less depreciation to date, subject to a possible impairment write-down.

This convention ignores changes in the purchasing power of money and can produce different values for identical items but simplifies the task of maintaining bookkeeping records.

(d) Prudence: The preparers of the financial statements should avoid presenting an unduly optimistic set of results. Thus, the lowest *reasonable* figure should be stated for profit or for any of the assets. The highest *reasonable* figure should be stated for any liabilities.

However, it is not permitted to include deliberate margins in the financial statements by understating assets or revenues or by overstating expenses or liabilities. Prudence should only be applied in situations where there is uncertainty.

(e) Consistency: The figures published by the company should be comparable from one year to the next. Accounting policies should not, therefore, be changed from one year to the next unless there is a very good reason for doing so. Any changes should be highlighted and their impact explained.

(iv) Before attempting to interpret the accounts of a provider, it is necessary to be familiar with the rules governing the preparation of the accounts and also the accounting rules and conventions that apply in the countries concerned. There maybe different structures, items in different places, items lost in translation or a bias if there is more familiarity with one regime.

The accruals concept avoids the random allocation of costs to periods depending on whether a bill happens to have been paid or not.

Similarly, the realisation concept avoids the fluctuations in reported income which might arise if everything was accounted for on a cash basis.

For insurance companies there will be additional issues as premiums received will need to be considered over the whole term of the policies not only the accounting year in which they are received.

Reserves will need to be set up and this will affect how the profit on the business is reported.

There may also be issues due to liquidity problems not being recognised. The realisation concept can create the impression that a business is performing well when, in fact, it is in danger of running out of cash. A business which is expanding might report income long before the related cash inflows are received.

So any differences in applying the accruals and realisation concepts will make it difficult to compare the two companies.

Most investment type assets, i.e. securities, derivatives and (non owner occupied) property, are recorded at "fair value" (broadly market value) although redeemable fixed interest securities may be held at amortised cost in certain circumstances. Using the cost concept will give very different values and these values may be too high or too low but they will not be realisable.

If assets are shown at market value, consideration should be given to the vulnerability of the asset values to changes in market conditions.

The cost concept will exclude non-purchased intangible assets, such as the brand names and trademarks, on the grounds that there is no objective way to attach an initial value to them. These, however, may be of great value to a particular company.

Using prudence will means that there is very little danger of the figures lulling anybody into a false sense of security by overstating the company's strengths.

For example, using "fair values" rather than prudence will mean revaluing assets (and liabilities) in the statement of financial position at the end of each accounting period. Any loss on revaluation should be included in that period's income statement. Any gain on revaluation is taken to the revaluation reserve in the statement of financial position, where it is held until the gain is realised (i.e. the asset is sold). A consequence will be volatility in the financial statements

In practice it is often difficult to prepare the accounts for insurance companies in accordance with the consistency concept because of the uncertainty in determining the various items in the accounts, in particular the provisions. If the provisions established at the end of the year are weaker, in relation to current conditions, than those established at the end of the previous year, the profit for the year will have been overstated, and vice versa.

When comparing the accounts of the two companies, it will therefore be necessary to analyse the impact of any changes made. However, this could be time consuming and costly.

Insurance business is subject to cyclical effects that may affect many providers at more or less the same time. This makes it necessary to compare the profitability of a provider's business (as distinct from the profit disclosed by the latest set of accounts) with the results disclosed by the accounts of other providers, especially those transacting similar types of business. As these two companies carry out business in different countries they may be involved in different cycles, trading environments etc and so this may make comparison more difficult.

It is necessary that the differences in accounting concepts identified between the two countries can be clearly and concisely articulated to other users of the financial statements and when communicating results.

This question was not well answered. Parts (i) and (ii) of this question covered core reading of a new area of the syllabus. It is important that candidates understand the importance of the actuarial profession having actuarial standards. Parts (iii) and (iv) were also not answered well. Within accounting standards companies have some discretion on how they apply them so analysts always need to take care in comparing financial reports between companies and even of the same company over time. When different accounting standards apply, comparisons between companies are harder and an understanding of the differences in the accounting standards are required so that adjustments can be made to make comparisons on a like-for-like basis.

6 (i) Tax

The likely tax treatment of both benefits and contributions will depend on the policy objectives of the country and may vary over time according to risks including political.

The tax system is often used to both encourage and discourage certain behaviours.

Tax systems are used to redistribute wealth, therefore, there are often limits to tax concessions as part of the optimal use of the finite resources available.

Endowment assurance

In some regimes, tax relief may apply to contributions made to such savings vehicles.

This is more likely for products such as this that are long term.

However, given the nature of benefits (lump sums and surrender benefits), the authorities may be reluctant to give significant tax concessions.

Assuming that contributions are paid out of taxed income, benefits may well be tax-free.

It is less likely that tax concessions will be granted to investment returns on policyholders' funds.

Loan to buy property

Tax concessions are less likely for this vehicle than for the others.

Tax relief on loans to purchase property if they exist are likely to be limited to main residences rather than investment vehicles.

Likewise, it is likely that tax will be payable on sale proceeds at the end of the 30 year period.

However, rental income may receive favourable tax treatment e.g. if the authorities wished to boost private rented provision and/or reduce state provision.

Deferred annuities

As these arrangements are specifically set up to provide retirement benefits, it is possible that tax concessions will be more significant here than under the other two options.

In particular, tax relief on the single premiums is possible – assuming one contribution per tax year.

Also, investment proceeds on policyholders' funds may well receive tax concessions.

Given that contributions are likely to come out of untaxed income, tax may be payable on benefits received. However, allowances may be higher for pensioners (and marginal tax rates lower) and some concessions may apply e.g. if a limited part of pension is commuted for cash.

(ii) **Inflation protection**

Endowment assurance

The policy is with profit and hence bonuses may provide some inflation protection if held until the end of the term.

As the policy is long term, there may be significant exposure to real assets again implying an inflation link. But if the underlying assets are not real then may not keep pace with inflation.

This may be reflected in the philosophy applying to the split between reversionary and terminal bonuses or smoothing to reduce volatility.

However, premiums are likely to be fixed. Hence, if inflation were high, even allowing for bonuses, benefits may not be sufficient.

To maintain overall real values, the individual may need to increase premiums or take out additional policies.

Loan to buy property

The individual has direct exposure to a real asset and so this route should offer the best protection against unexpected inflation.

This is compounded by gearing since the loan used to buy the asset is fixed in nominal terms and so reduces in real terms as inflation rises.

But it would be expected that the loan repayments would increase if inflation rose.

However, the individuals earning and rental income may also broadly increase with inflation so keeping the loan serviceable. Regulation may limit inflationary exposure e.g. rental controls.

The price of a single house may be very volatile (e.g. depends on location) over 30 years and it may not correlate to other measures of inflation.

Given that rental income probably wouldn't cover loan repayments at least initially (loan requires repayment of capital), the individual is vulnerable to low inflation.

Deferred annuities

Benefits may be real or fixed in monetary terms. If fixed, in principle, most exposed to inflation compared to the other options. I.e. retirement inflation protection only if buy appropriate benefits.

However, inflationary expectations are factored into premium rates. Higher expected inflation implies high nominal returns pre retirement and favourable annuity factors. Hence the risk is higher unexpected inflation.

This is mitigated to a degree since new rates apply each year i.e. they will adjust to reflect up to date views of future inflation (also has a downside in terms of "losses" if inflationary expectations fall).

The new policy each year approach means that contributions can be adjusted upwards with inflation so maintaining real values of ultimate benefits.

(iii) **Expenses and admin**

Endowment assurance

As this is a one-off, stand alone policy expenses and admin complications should be relatively low compared to the other alternatives.

But, depending on the sales channel, commissions could be quite high.

The policy is with profit, which means that expense charges may not be transparent so leading to a risk of over-charging.

Likewise, expense charges could be relatively high if this line of business were being used to subsidise other lines where expense charges were more explicit. As well as extra administration practicalities if the policy is not on target

Loan to buy property

This approach is likely to give rise to the greatest expenses and admin complications. For example researching and time to find property as well as the specific costs related to buying property e.g. solicitors, stamp duty.

Taking out a loan will involve relatively high arrangement fees (e.g. underwriting) and management fees – they may be implicit in the interest rate and so again lack of clarity could imply over-charging.

Setting and collecting rent will be expensive. It will need detailed records (e.g. legal and taxation issues). The same applies to finding good tenants (e.g. costs of voids).

Upkeep and maintenance will be costly – especially since the property is let out. Supervision will be time consuming and messy.

To obtain benefits, it is likely that the house will need to be sold on retirement. Again this will incur high expenses and involve a lot of time and effort.

Deferred annuities

Single premium policies should in theory be less expensive to process e.g. commissions may be relatively low.

But this is an annuity policy hence these lower expenses may be offset by higher claims and maintenance expenses (term will be very long – hopefully).

Any savings due to the single premium nature may be lost since a new policy is taken out each year (assuming that initial expenses are significant).

This will also make admin more complicated as separate records will be needed for each policy and keeping track of total benefits may be tricky. It is also possible that terms and conditions will vary over time (e.g. in relation to guaranteed increases pre and post retirement – legal background could change) again making admin complicated.

(iv) **Death benefits**

Endowment assurance

This approach is likely to provide the most valuable and certain death benefits.

There will be a minimum cash sum, which may also attract bonuses, which should be relatively valuable whenever death occurs.

The relative importance of the death benefit will depend on the particular nature of the product.

For example, the individual may be able to opt for a policy with high death benefits or they may prefer one with a lower (say fixed no bonuses) death benefit with the emphasis being on the savings element.

Loan to buy property

The value of the benefits on death will be uncertain it depends on the market value property less the outstanding amount of loan at the time of death. This could be in theory be a valuable asset, however, this is not guaranteed and the value could be negative if the market value of the property has fallen since purchase.

If death occurred at a young age the outstanding loan will be higher so it is more likely the value is low or negative.

Where there is greatest risk that the value is negative the individual may be required to take out life assurance (decreasing term say) to provide for partial

or full repayment of the loan on death. If so, this could clear the loan and leave the full house value as an asset.

Deferred annuities

The policy will set out the benefits on death before retirement. The precise benefits will depend on the type of death benefits chosen as part of the policy.

The level of death benefits has a cost. For a given premium the higher the death benefits the lower the retirement benefits. Often the value of death benefits is low to maximise the retirement benefits for example return of the premium paid (plus interest). Hence the death benefit may be relatively small especially at young ages.

Legal and/or cost implications may mean that the provision of annuities on death before retirement is unlikely. Even if they were provided, they may not be equal to the expected annuity at retirement and so generous benefits are unlikely.

(v) **Early retirement provisions**

Endowment assurance

The maturity date is fixed, however, provided there is an option to surrender the policy prior to maturity early retirement benefits would be available.

This could be done at any time and so there would, in theory be a great deal of flexibility to retire early.

However, the benefits will be lower, especially if the surrender penalties are significant e.g. in respect of terminal bonuses. The value of surrender benefits will generally be lower the further from full term surrender occurs. A with-profit policy provides an investment guarantee at maturity. If investment returns on the with-profit fund have been low even close to full term the surrender benefits could be much lower than the maturity benefit. In practice this would reduce flexibility.

Some policies may have a flexible term e.g. no surrender penalties within five years of full term. But such options have a cost e.g. in terms of lower expected bonuses.

Loan to buy property

This option will offer the greatest theoretical flexibility to take benefits whenever they are desired.

The individual will need to pay the interest on the loan, however, they will have flexibility on how the excess income from the rent is used. For example whether it is used to repay capital or as income for the individual.

Alternatively, the individual could sell the property and repay the loan leaving a residual capital sum (net of any tax liability).

If the value of the house doesn't increase much or if capital on the loan isn't repaid quickly enough, in practice, the individual may not be able to retire early.

Also, there may be early repayment penalties on the loan and/or difficulties (e.g. as a result of legal risks) in selling with sitting tenants. Both will reduce actual flexibility.

Deferred annuities

This product will probably qualify as pensions business and so attract tax concessions.

This is a without profit policy so the options available, if any for early retirement will be know at outset. There is likely to be much less flexibility that under the other alternatives.

If there are early retirement options available then the basis for determining the early retirement benefits will be know in advance.

Even if the individual were able to retire early, large reduction factors may apply to the normal retirement pension. So again, flexibility is more apparent than practical.

It is possible that the policy includes benefits on ill health prior to retirement increasing the flexibility to retire early in certain circumstances (though more likely to apply to pension scheme benefits rather than deferred annuity contracts).

(vi) **Nature of benefits**

Endowment assurance

The benefit will be in the form of a cash sum, which gives great flexibility in terms of options available to the individual.

In particular, there will be no restrictions in terms of taking a large cash sum as opposed to converting benefits into an annuity.

However, if the individual did wish to take an annuity, this would depend on the annuity rates at retirement. If interest rates are low and/or life expectation higher than expected the individual is exposed to the level of income being lower than anticipated even if the cash sum was as expected.

The individual would not be forced to buy the annuity at maturity. He could delay buying an annuity until the market moved in their favour but there is a risk they do not move in his favour.

The individual would also have choice in terms of annuity provider and terms and conditions (e.g. spouse's benefits or pension increases), which would be attractive.

Loan to buy property

This option provides flexibility as it is an open ended investment.

There is the option to continue to rent the property and receive the rental income as a regular income net of expenses, i.e. rather like a pension. The amount of income available is likely to depend on market level of rents and the level of expenses involved in renting and maintaining the property and any outstanding loan amount.

Alternatively the property could be sold to provide a cash sum (net of any loan outstanding and tax liability). The individual has the flexibility on how the cash sum is used. The entire or some of the cash sum could be used to purchase an annuity, or used to purchase another property for renting out to tenants.

This will take time and there will be uncertainty over the price that could be achieved e.g. may need to lower sale price if they need cash benefits immediately.

If an annuity is purchased he will be able to choose the type of annuity purchased e.g. spouse's benefit and/or pension increased, and the annuity provider.

Deferred annuities

The retirement benefits including any options will be set out in the contract, as such the benefits available will be restricted.

The benefit here will be in the form of a guaranteed pension for life, which will protect the individual against longevity risk and against poor annuity rates at retirement.

The individual may be able to exchange some pension for cash but the amount may be restricted and conversion terms may not be generous or guaranteed.

The terms of payment e.g. spouse's benefits or guaranteed increases may have been fixed when the policy was taken out – hence they may not now be suitable e.g. was married now single etc.

It is possible that the individual may be able to change these terms but again options will have a cost.

All parts of this question were reasonably well answered.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

16 April 2013 (pm)

Subject CA1 – Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 (i) Define the term risk budgeting. [2]

(ii) Outline the risk budgeting process for an investment fund holding a range of asset classes. [7]

[Total 9]

2 A life insurance company is launching an enhanced annuity product. An individual will be eligible for the enhanced annuity and receive an increased income, if they can prove that they are expected to have a shorter life expectancy than the average annuitant.

(i) Outline the information which would be required to identify whether an individual is eligible for the increased income. [3]

(ii) Discuss the impact of the wider external environment in pricing this product. [7]

[Total 10]

3 (i) Discuss the differences between market risk and liquidity risk. [9]

(ii) Suggest two distinct events that can give rise to liquidity risk for an insurance company. [2]

[Total 11]

4 (i) List the four principal aims of regulation of financial markets. [2]

(ii) Outline why a regulatory solvency regime for insurance companies may have more than one measure of capital requirements. [6]

(iii) Outline the advantages of a multinational insurance company using an economic balance sheet to determine its capital requirements. [6]

[Total 14]

5 A large insurance company, which has been selling various personal lines products for many years, is now considering selling travel insurance.

(i) Outline the advantages and disadvantages of:

(a) selling the product directly
(b) using travel agents to sell the product

[3]

(ii) Outline the items of data that the insurance company would need in order to price this new travel insurance product. [6]

The insurance company has invited an airline to act as a distribution channel for this product.

(iii) Discuss the impact, on the insurance company's business model, of selling travel insurance through the airline. [7]

[Total 16]

6 (i) List the main uses of data in actuarial work. [4]

A defined benefit pension scheme is closed to future benefit accrual. Its latest annual valuation has just been completed and this shows that the scheme's surplus has increased to ten times its previous level.

(ii) Outline the checks on the data that should be made to ensure the surplus is correct. [7]

The data has been checked and no errors have been found.

(iii) Suggest reasons why the surplus could have increased. [5]

One of the trustees suggests that the scheme should take advantage of the increase in surplus, by winding up the scheme and using the surplus to improve members' benefits.

(iv) Comment on this suggestion. [4]

[Total 20]

7 An internationally famous rock musician has had a long and successful career. The musician receives substantial income: royalties from his previous work; sales of new material; and regular large-scale global tours.

A management company looks after all the business and financial affairs of the musician. This company has been associated with the musician for many years. However, over that period it has changed ownership several times and the people directly responsible for dealing with the musician have also changed many times.

The musician is concerned that he is not receiving an appropriate service from the management company. In particular, he is worried that his revenues are not being managed effectively in accordance with his needs. The musician has asked for independent financial advice.

(i) Outline the specific insurance and savings requirements which may be appropriate to protect the business and financial affairs of the musician. You do not need to consider particular investment vehicles or asset classes. [5]

(ii) Discuss the major issues the independent financial adviser would need to investigate in order to assess the efficiency and adequacy of the arrangements set up by the management company. [10]

The musician is considering raising cash by selling the income from future royalties to investors in the capital markets.

(iii) (a) Explain how the musician could sell this income.

(b) Outline the details of this income that will need to be defined. [5]

[Total 20]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2013 Examinations

Subject CA1 – Actuarial Risk Management

Paper Two

Introduction

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

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

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

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

D C Bowie
Chairman of the Board of Examiners

July 2013

General comments on Subject CA1

This subject examines applications in practical situation 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 candidates who perform best learn, understand and apply the principles rather than memorising the core reading.

The examiners set questions that look for candidates to apply the principles specific to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. Detailed specialist knowledge is not required and nor is very detailed development of particular points.

Good candidates demonstrate that they have used the planning time well to understand the breadth of the question and to structure their answer – this 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 April 2013 paper

The general performance was about the same as that in September 2012. Questions 1 & 3 were on average 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 (i) Risk budgeting is the process of establishing how much risk should be taken and where it is most effective to take the risk (in order to maximise return).

It can be done at an organisational level i.e. the whole company, or down to a portfolio level

(ii) The risk budgeting process for investment risks has two parts:

- The first part is deciding how to allocate the maximum permitted overall risk between total fund active risk and strategic risk.

- The second part is allocating the total fund active risk budgets across the component portfolios.

The key focus when setting the strategic asset allocation is the risk tolerance of the stakeholders in the fund. This is the systematic risk they are prepared to take on in the attempt to enhance long-term returns.

The key question on active risk is whether it is believed that active management generates positive excess returns.

Risk budgeting is, therefore, an investment style where asset allocations are based on an asset's contribution to the portfolio as well as on the asset's expected return.

A risk budgeting strategy can free the manager to look for alternative investments that might increase the expected return on the portfolio.

The constraint is that the total risk of the portfolio must stay at or below a target level, so increased attention is paid to low correlation investments.

Allocations to such investments can reduce the total risks of the portfolio through diversification.

Most candidates knew the bookwork definition and some of the basics of allocating risk budgets, but few were able to develop this sufficiently to score well in part (ii).

2 (i)

- Smoker status – and how many cigarettes each day
- Weight and Height such that BMI can be calculated
- Alcohol consumption
- Any current medical conditions (e.g. Diabetes)
- Current Blood Pressure
- Medical History – any conditions relevant
- Any medication currently taken and how much and for how long
- Family History – any conditions relevant
- GP details so that records can be accessed

- Previous occupation – may give rise to health problems
- Address

(ii) **Legislation and Regulation**

In some countries annuity purchase is compulsory
Will need to consider the ways that this product is sold – for a complicated product like this it will need to be an advised process
Will also need to understand if there are any regulations around how annuity products can be priced – e.g. pricing by gender may not be allowed

State Benefits

Will need to consider if the state gives members any additional benefits – and also whether offering an enhanced annuity means that the member will get less state benefits (depending on how much it is means tested)

Tax

The tax treatment of this product will be similar to a standard annuity – however if the additional benefits moves the member from one tax bracket to another this will need to be considered

Accounting standards

It is likely that this product will have the same requirements as a normal annuity – i.e. they will need to be reported in the company accounts. There may be a requirement to disclose the percentage of business that uses different mortality assumptions (and/or an explanation of the different underwriting that leads to an average assumption will need to be explained)

Capital Adequacy

Will need to consider what capital stresses will need to be made to obtain the capital levels required for this type of product

Corporate Governance

Will need to consider whether this product changes the corporate governance of the company

Risk Management requirements

Will need to consider the operational and business risk for this product

Competitive Advantage and Commercial Requirements

Will need to consider the position in the underwriting cycle – this will determine the profit levels that this product could make

Will also need to consider what competitors are offering in particular around similar enhancements

Changing cultural and social trends

There may be a trend towards giving up smoking so an enhancement might be offered and then the annuitant subsequently gives up and this could mean that the member lives longer than underwritten for. There is also a moral hazard where someone could temporarily take up smoking
The offer of enhanced annuities in retirement may be considered to promote unhealthy lifestyles

Technological Changes

May have a problem of medical advances meaning some of the uplifts given for certain diseases might be overstated in the future
New tech may significantly improve the process of obtaining information from medical records (if a national register is easily sourced), and this might also reduce the possible moral hazards of filling in the forms incorrectly
Also need to know the impacts on the other business the company is writing (in particular the other annuity business)

This question was generally well answered. Good candidates made their answer relevant to the enhanced annuity product.

3 (i) Market risk is the risk relating to changes in investment market values or other features correlated with markets, such as interest and inflation rates.

Liquidity risk is the risk that, although solvent, a company does not have sufficient financial resources available to meet its obligations as they fall due.

Liquidity risk can give rise to market risk.

For example, the value of an asset depends on the ability to sell an asset in an orderly way.

A trading company may well have sufficient assets, probably largely stock and work in progress, to cover its liabilities, but if those assets cannot be realised, then the company may not have sufficient cash to pay creditors, who can force it into liquidation, and possibly to cease trading.

Insurance companies, benefit schemes and other financial institutions also have to manage exposure to liquidity risk. Insurance companies need to balance holding cash versus bonds and stock market assets. In general, bonds and stock market assets can be sold in the market to raise cash when required provided they can be sold in an orderly way without moving market prices.

In financial markets, liquidity risk is where a market does not have the capacity to handle (at least, without potential adverse impact in the price) the

volume of an asset to be brought or sold at the time when the deal is required. This causes additional market risk for other holders of the asset.

In general, the liquidity and market risk for larger markets will be less than for smaller markets.

Small issues or indivisible assets have less liquidity and more market risk.

(ii) 1. A weather catastrophe can give rise to very large claim outgo

2. A large number of surrenders can make an insurer a forced seller of assets to meet the claim outgo

Most candidates defined market risk and liquidity risk but the discussion on the differences between them was often weak. Part (ii) was well answered.

4 (i)

- To correct perceived market inefficiencies and to promote efficient and orderly markets
- To protect consumers of financial products
- To maintain confidence in the financial system
- To help reduce financial crime

(ii) A regulator has responsibilities around both maintaining confidence in the financial system and protecting consumers of financial products.

To provide protection to consumers a regulator will want to ensure that insurance companies hold sufficient capital.

However, there is a balance, the more capital required to be held the higher the cost of holding that capital and so the higher the cost of financial products.

There are a number of elements that contribute to the risk that an insurance company represents. A regulator will often use a number of objective measures as it is difficult for a single measure to capture all aspects of risk.

To be effective a regulator needs to decide on which insurance companies to focus on and the level of intervention.

A regulator will use more than one measure of capital requirements because this provides a basis for deciding on the level of intervention that balances protecting consumers with maintaining confidence in the financial system. Early intervention can provide an insurance company with time to take more gradual action helping maintain confidence in the financial system. However, by having more than one measure of capital the regulator has an objective basis for deciding when more extensive action is required in favour of protecting consumers versus allowing the insurance company to trade with greater freedom.

(iii) A multinational insurance company operates across a number of countries and so will be subject to different regulatory regimes in different countries.

The different solvency regimes will have differences in the inbuilt prudential margin, to a greater or lesser extent, depending on the regulatory regime.

The level of inbuilt prudential margin often varies by product between regulatory regimes and these differences make comparisons across regulatory regimes difficult.

An economic balance sheet is based on a risk based capital assessment. An economic balance sheet shows the market values of a provider's assets (MVA) and market values of a provider's liabilities (MVL) and the provider's available capital, which is defined as the difference between the MVA and MVL. The available capital is then compared with the economic capital requirement to assess the provider's solvency status.

The value of a multinational insurance company using an economic balance sheet as a starting point for capital requirement assessment is that it starts with assets and liabilities both being assessed on the same, market consistent, basis across all the countries.

The insurance company's economic balance sheet can apply the same approach to determining capital requirements across all the countries. This allows the multinational to compare all insurance companies across all countries on a consistent basis.

The economic balance sheet can also allow for diversification across the group as if it was a single large insurance company.

The insurance company can control the methodology used for the economic balance sheet and therefore can capture the specific risk profile and make it appropriate for the insurance group. The insurance company has control over the level of sophistication within the economic balance sheet, and this allows it to trade off cost, complexity and time-consumption.

The economic balance sheet can allow it to apply a consistent basis when deciding where to allocate capital to provide the optimum trade off between risk and reward.

Part (i) was well answered bookwork. In part (ii) most candidates outlined why there may be more than one measure of capital requirements and referred to Solvency 2, but only the stronger candidates linked this to the regulatory aspect (and the points they had made in part (i)). Part (iii) was poorly answered: many candidates gave a general answer about the advantages of using an economic balance sheet without focus on the multinational insurance company.

5 (i) (a) Selling the product directly will use existing distribution and so will minimise costs. Admin systems and staffing is already in place. But this is a new area for the insurer so may be lacking expertise and data.

They will have more control over how the product is sold and who to.

Cheaper option in terms of initial outlay i.e. capital costs but ultimately could result in extra work and mispriced policies.

(b) The insurance company will benefit from the travel agent's existing distribution channels. They may also have the data and experience the insurance company needs.

They will have less control over how the product is sold and who to.

Possibly low initial capital outlay but a sharing of profits. There may be some cultural issues (eg related to selling practices) and possibly a risk to their reputation.

(ii) Data will be required to calculate expected claims and an exposure period and thus a risk premium and possible loadings.

Policy data

- Dates on cover
- Policy limits and excesses
- Distribution channel
- Exposure measure e.g. number of people covered, length of stay
- Rating factors e.g., age, sex (depending on country), state of health
- Reason for travel
- Destinations covered
- Winter sports, hazardous pursuits covered
- Coverage and exclusions

Claims data

The company will not have their own data so will need data from reinsurer or industry data if this is available

- Amount(s) of claim
- Frequency of claim
- Currency
- Reason for claim e.g. flight cancellation
- Trends e.g. inflation, underwriting data

Other pricing data

- Expenses, direct and indirect
- Investment return

- Reinsurance premiums
- Competitors' premiums
- Inflation e.g. medical
- Business mix/volume of business

(iii) The insurance company will need to work with the airline. There will be different cultures and there will also be time and costs involved.

Travel insurance can be sold when the tickets are booked with the airline. It can also be sold when the passengers are on board.

Likely to be single trip policies i.e. for that holiday rather than an annual policy.

Potentially lower premium higher volume compared to annual policies.

Hence lower brand loyalty, the consumer is choosing the company for the flight/holiday not for the insurance.

No lapse issue.

Highly competitive in travel industry, although there may be less competition for any policies sold on board.

But potential for cross selling once have policyholder details.

Large pool of data for experience analysis.

Change in the nature of the target market. Holiday makers buying flights rather than holidays hence many travellers may not have considered purchasing insurance.

Captive market and cheaper advertising. i.e. just an announcement in-flight

This product is likely to be of shorter duration. And to reduce risks the amount of cover available is likely to be limited e.g. just medical, possessions and cancellation and there may be many exclusions e.g. pre existing conditions and dangerous pursuits

The premium structure will need to be fairly simple and easy to calculate. Could use a standard premium with standard adjustments for health, reason, country, duration etc. For example there could be a standard premium for certain flights (depending on their destination) and then this could be adjusted depending on reason for travel and age band selected.

Short questionnaire and limited underwriting. Ultimately this is a cheaper model but there is less rating and more risk of miscategorization of risk (and broader risk groups) and so have to allow extra margins. Less risk of anti selection. The target market is already en route.

Lower cost i.e. processing and paperwork involved is much less. No glossy policy documents.

Policy wording as regards international boundaries. If the policy is taken out once the flight is airborne, the policyholder is no longer in their country of residence. Impact on policy wording, may involve lawyers and so increase cost

Payment risk. The payments will be made to the airline so there may be a credit risk as the policyholder is on risk immediately.

There will be a concentration risk in using one airline.

Part (i) was well answered. Part (ii) was also generally answered well, though weaker candidates did not consider all of policy/claims/other pricing data. Part (iii) was answered poorly: only stronger candidates made points specific to the question.

6 (i)

- Administration
- Accounting
- Statutory Returns
- Investment
- Financial Control, Management Information
- Risk Management
- Setting Provisions
- Experience Statistics
- Experience Analyses
- Premium Rating, Product Costing , Determining Contributions
- Marketing

(ii) **Asset Data**

- Check that the asset still exists on the given date of the valuation
- Check that the asset is still owned by the scheme at the date of valuation
- Check that the correct market value of each of the assets has been recorded correctly (and check the decimal places of the MV have been recorded correctly)
- Check that the asset value has been calculated correctly (if not market values)
- Check that the data is complete – i.e. there are no missing assets
- Check that an asset has not been recorded twice or more times
- Check that only the appropriate assets have been included
- Check that there is consistency between investment income implied by the market data and the corresponding totals in the scheme's accounts
- Check that any assets purchased or sold in the period since the last valuation have been correctly input/included

Liability/Scheme info data

- Check that the data is complete – i.e. there are no missing members, and that spouses liabilities have been included correctly once the member has deceased
- Reconcile the total number of members (by status between current employees /deferreds/pensioners) and any changes in the membership over the period
- Check that the members benefits (pensions) have been correctly recorded
- Check that any benefits that escalate over time have been correctly increased
- Checking both average increases for each class and min/max individual increases
- Check consistency between the salary related increases to members benefit and the membership data and the corresponding figures in the accounts
- Check for unusual values – for example impossible dates of birth, retirement ages or start dates or pensions/salaries.
- Check the movement data against appropriate accounting data, especially with regard to benefit payments
- Random spot checks on data for individual members
- Check that any members that have transferred their benefits have been correctly paid
- Check that all planned events have occurred

(iii)

- The asset values may have increased significantly more than expected – may have been lucky in the investment decisions that have been made.
- One or two of the assets may have made significant gains and these have been realised.
- There may have been significantly more members that have died compared to the assumptions of the scheme, and death benefits are lower than the valuation reserve.
- May have had very low escalations (salaries and/or pensions) compared to the assumptions adopted in the scheme valuation
- There may have been options available and those chosen have been to the benefit of the scheme.
- The scheme may have paid significantly lower transfer values than the true value to the member and hence created a surplus in the scheme.
- The scheme may have changed some of the assumptions– these may be due to changes in market conditions or based on the experience of the scheme.
- The rules of the scheme or government regulation may have changed such that the liabilities have significantly reduced –e.g. a change in the inflation assumptions.
- May have had changes to the tax regulations around returns made on assets – e.g. no tax on dividends held within a pension scheme.
- Trustees may have decided to not offer any discretionary benefits compared to what might have been assumed in the assumptions.

- Company may have made contributions to the scheme despite the existing surplus.
- The previous surplus may have been very small so ten times this level is not a significant change
- The surplus may be volatile if the scheme is small.
- If scheme closure took place since the previous valuation, this may have been a source of surplus.
- Errors may have been made in the calculation of the previous surplus.
- Data audit since last valuation removing incorrect benefits/members.
- Assumptions may be deliberately prudent, so expect an improvement in the funding position.

(iv) Winding up funding level probably won't be the same as the reported valuation position.

The valuation basis may not have targeted the wind-up position

Even if it did, this won't be the same as an actual insurance quote for buying out all benefits and dealing with wind-up expenses

Surplus position will have changed since the valuation date

Also, some of the benefits may change on wind-up

The scheme was closed to future accrual, but some may have still been linked to future salary increases?

What happens to any future options such as exchanging pension for cash at retirement?

Do the trustees have power to trigger a wind-up?

And do they have power to use surplus for benefit improvements, or do rules require surplus refund to employer?

If benefit improvements are to be made, the trustees will need to decide how to fairly allocate between members, allowing for any requirements in the scheme rules or legislation

Trustees should also urgently consider investment strategy so as to lock into the current funding position

Winding up the scheme could potentially improve the security of the members' benefits. This would depend on the covenant of the sponsor.

Well prepared candidates scored very well on parts (i) and (iii). In part (ii), most candidates outlined many relevant checks for liabilities but far fewer checks on assets. Part (iv) was reasonably well answered: most candidates realised that the winding up funding level was likely to be different from the latest valuation position, but few commented on how the suggestion might affect members' security of benefits.

7 (i) The individual will probably own substantial amounts of property. Therefore property insurance will be needed.

Specialist cover (damage and/or liability) will be needed to cover items such as:

- Overseas property
- Commercial property (e.g. held as investments)
- High performance cars
- Boats
- Planes
- Musical equipment
- Image rights/reputation/copyright infringement etc.

The individual receives revenue from music and related sales and some form of insurance may be needed for example failure of distributors or producers.

There may also be product liability issues e.g. surrounding influencing behaviour of fans etc.

Substantial revenues are likely to arise from the tours and they will be large-scale operations where the individual may be acting as an employer. Insurance will be required to cover:

- Employers liability i.e. injuries to road crew etc
- Public liability i.e. injuries to audience members or damaged hotel rooms
- Property damage to sets or equipment
- Cancellation or low ticket sales cover due to illness etc
- Cover against dishonest acts of employees e.g. embezzling ticket money
- Events that could stop touring career e.g. critical illness or accident cover

Health insurance may be needed, and for example specific cover for hands/voice required to perform.

As the individual probably has significant assets and guaranteed future revenues (old songs viewed as "pensions"), life assurance and specific pensions savings may not be that relevant.

However, pensions policies may be attractive due to tax advantages and so advice will be needed.

There may be loans outstanding relating to purchase of properties. Life cover may be needed as a condition of such loans. These loans may also have an impact of the nature of savings required.

Much of their income may be from overseas – hence the most appropriate tax regime needs to be considered.

Much of the specific savings may be tailored to provide funds for transfers to dependents e.g. trusts for children, avoidance of inheritance tax. (i.e. better to arrange affairs so that no tax is payable rather than have life cover to pay tax bill)

Alternatively, savings may be targeted to provide funds on specific events e.g. when too old to tour or when copyright runs out on old material.

In any event, there are still likely to be significant revenues to invest with no specific purpose. Advice will be needed based on the individual's risk appetite in terms of security versus high potential returns.

Alternatively, if consumption is high, advice may be needed on striking a balance between spending and saving.

(ii) There are two areas here:

- Efficiency: This will focus on costs and returns.
- Adequacy: This will focus on the correct level and range of cover/provision and particular policy details.

Efficiency

It will be important to know how much the musician is paying the management company for their services and how these charges are applied.

To the extent that any fees are included in a general management charge, a full breakdown of all charges split by reason will be needed.

This may enable the adviser to consider other services provided or look at where revenue is coming from or going to.

A particular concern is the extent of changes involving the management company: Who exactly is providing the advice and are they qualified or experienced enough to do it well? Are there clear procedures and guidelines to follow (if so, are they too generic) or are decisions left to junior staff?

In particular, the changes may mean that staff responsible don't know the client well enough and aren't familiar with their specific needs.

It is likely that initially, this musician was a significant client for the company but with changes of ownership, he could be less relevant and hence not get the appropriate level of service.

Being managed via a large company (as looks likely here) could work in the musician's favour as expertise and a lot of similar clients could enable good deals to be struck. Alternatively, there may be cosy and expensive arrangements with providers favoured by the management company.

If expertise is lacking, the management company may employ brokers or third parties so adding in an extra layer of expense.

It will also be necessary to check that all record keeping is correct. Can then investigate potential fraud or inefficiencies.

Adequacy

For each insurance policy, the advisor will need to investigate the level of premium and whether it looks reasonable compared to market rates.

However, given that this individual will have specific needs, care must be taken to consider like with like.

The particular features of the policy must provide the cover the musician needs i.e. does it match the risks in terms of amount and scope.

To this extent, particular focus will be needed on any exclusion clauses and on maximum payouts (or potential under-insurance).

It will be important to ensure that correct information was supplied when taking out the policy. Crucially, status as a rich musician must be clear. It is likely that individual underwriting will be done and so wrong information could cause problems with claims. This may be especially relevant to property loss e.g. levels of security, homes unoccupied or particular contents held in property.

There may be many things to cover in many locations. Hence, are lots of policies held or would it be more effective to group and combine policies?

Touring will not be continuous. Hence it will be necessary to consider whether policies relating to tours should be arranged as and when needed or if an ongoing recurring policy would be more efficient.

When looking at premiums, the adviser should investigate whether commission is being paid to the management company – raising the possibility of double charging.

For the savings arrangements, the advisor will need to investigate whether all the musician's specific needs (outlined in (i)) are being addressed? That is, are those liabilities or objectives being matched?

It will be important to make sure the level of risk taken is in line with the musician's risk appetite.

Is the amount of cash held appropriate to the needs of the musician?

In particular, many specific needs are term related and so savings should be set up with this in mind.

Likewise, currency will be a major factor. The musician may have obligations and needs in many locations e.g. property loans or residences in several countries.

The musician is likely to have sources of revenue in many different currencies. It will be necessary to investigate whether hedging will be required if these sources don't match the desired savings by currency.

Similarly, many savings (pensions and trusts) will have advantageous tax treatment. It will be important to ensure that full use in being made of all such allowances – such allowances may vary be country and so each source of revenue will need to be considered.

Linked to this, it may be possible to set up arrangements that move sources of revenues to exploit tax loopholes – the adviser may be able to give some general advice but detailed tax planning would be beyond their remit. The musician would, however, need to ensure that using a particular tax saving vehicle did not lead to unwanted negative publicity.

Clearly a key issue will be performance of investments/savings vehicles. This will apply both to specific matching vehicles and to more general savings.

Many of the investments are likely to be in the form of managed funds from investment companies. It will be relatively easy to compare performance of such funds against their peers.

It will be necessary to look at any charges or commissions payable under these funds both to see they are reasonable per se and to see if double charging is occurring.

Directly held assets are less likely (but if funds are large, they could be held as an individual portfolio with an investment company) and will be harder to evaluate.

But a measure of performance against an appropriate index for each class (allowing for the risk appetite adopted) should be possible.

In addition to looking at tax benefits on setting up specific vehicles, tax paid on investments will be important. Given the size of fund and likely tax rates, there may be plenty of opportunities to invest in a tax efficient way.

When looking at the portfolio as a whole, it will be necessary to consider whether the level of diversification is suitable – both by asset and by manager.

(iii) (a) Essentially, the musician could arrange for such future income to be securitised. That is, the musician could issue a tradable bond to investors in the market.

The musician would receive a lump sum representing the market's view of the value of future revenues.

Investors would receive coupons (and possibly capital) linked to the levels of future revenues.

Each nominal unit of the bond would be entitled to the same proportion of the total revenues and this would be specified in the terms of the issue.

In this way, the risk of uncertain future revenue is passed to the bondholders as such revenue is in effect paid to them.

However, given the potential volatility and large downside risk, future risks will be factored into the price investors are willing to pay. In effect, the musician sells the risk as a risk premium in the amount they receive. That is certainty now against future volatility.

(b) The most important issue will be to specify exactly what income is covered by the arrangement.

There will be lots of sources e.g. from new media some of which may not have been devised yet. It will be necessary to define whether the income is from all sources or from a list of specific sources.

Similarly, there may be confusion over the types of revenues that will be covered i.e. what exactly is classed as coming from the musician's previous work.

Likewise, sources of revenue will be from many different countries and in some of these it may not be possible to assign revenues in this way depending on the ownership/royalty structure.

It will be necessary to consider the situation with new material. That is will the revenues relate to existing material only.

It will be necessary to consider the term over which payments will be made.

The tax position of the musician will need to be considered: will gross or net revenues be passed over. Net implies a lot more uncertainty for investors.

Similarly, expenses will be incurred in administering the arrangement – will there be an explicit deduction to cover them or will the musician pay them from other resources?

Will also need to consider the currency. Will the income be received in different currencies or will it be converted?

Candidates who focused on the specific situation described in the question scored well in parts (i) and (iii). Part (ii) was not as well answered: very few candidates considered potential issues with the insurance arrangements despite having mentioned them in part (i), and many candidates gave generic answers about suitable savings arrangements.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

24 September 2013 (pm)

Subject CA1 – Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all six questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 (i) Outline why an insurance company should monitor its experience. [3]

LongLife is an insurance company writing a large volume of annuity business.

The annuity rates offered by LongLife depend on policyholder age and gender only. There are other companies in the market that offer enhanced annuity rates to lives in poor health, and the volume of this impaired life business is increasing.

LongLife is going to review its mortality experience to see if these new products have impacted its own experience.

(ii) Explain how the data could be grouped for this analysis. [4]

(iii) Explain how LongLife might use the results of the review. [3]

[Total 10]

2 Random Life is a large insurance company which operates as a number of business units specialising in different product types. A business unit selling term assurance wants to assess the capital required to protect it against ruin with a given ruin probability of 0.5% within one year.

(i) Summarise the main issues facing this business unit in completing the assessment. [3]

(ii) Explain the main risks to this unit that could cause ruin at the assumed level of probability. [4]

Random Life also sells annuity business and unit-linked savings products.

(iii) Discuss the reporting systems that Random Life would want to set up to manage the risk across the entire business. [3]

[Total 10]

3 A large multinational general insurance company sells a wide range of policies including travel insurance and health insurance. An analysis of its claims management expenses has shown that these expenses for the travel policies have been increasing steadily over recent years as a proportion of claims costs. The proportion is now 6.0% of claims costs compared with 3.9% five years ago.

(i) Outline possible reasons for this increase. [4]

(ii) Propose actions that the company could take to reduce this proportion. [2]

The company has also analysed claims costs. It has noted that a large proportion of travel claims costs relate to medical treatment. Its health insurance business runs chains of hospitals in each country where it sells health policies, and requires policyholders to use these hospitals for treatment covered under the health policies. The company is considering a proposal to require travel insurance policyholders to use these hospitals for treatment under their travel polices; this proposal is intended to lower both claims management costs and the treatment costs.

(iii) Outline how this proposal may lower both costs. [3]

(iv) Set out the issues which the company should take into account before adopting the proposal. [3]

[Total 12]

4 A large defined benefit pension scheme provides an increasing pension benefit on retirement. The membership includes pensioners and deferred pensioners. The scheme's trustees want to reduce the longevity risks in the scheme and are considering the use of financial products.

(i) Suggest suitable financial products that could be used and explain how the features of these products could reduce the longevity risks. [3]

(ii) Outline the advantages and disadvantages of using the financial products identified in part (i) to reduce the longevity risk. [4]

One of the trustees has suggested the two following options to reduce the risks:

- Offering pensioners a one-off uplift to their pension in exchange for all future pension increases.

- Offering deferred pensioners a higher than normal transfer value to encourage them to leave the scheme.

(iii) (a) Discuss the merits of each offer.

(b) Outline the factors that would need to be considered in determining the design for the offers. [9]

[Total 16]

5 (i) Define the term "solvency". [1]

(ii) State the pillars of the Solvency II requirements. [2]

(iii) Describe the features of an insurance company's business to be considered in a solvency assessment. [8]

(iv) Explain why solvency measures may be more significant for an insurance company selling annuity policies than for a building society providing only fixed savings accounts and secured short term loans. [3]

(v) List the main stakeholders who are affected by the solvency measure of an annuity provider and suggest how each stakeholder is affected. [7]

[Total 21]

6 Nimbus Circus has been running for a number of years. Each year a new show is put together and taken on tour through different countries. Over the last two years attendance has been falling and Nimbus Circus is keen to find a way to increase attendance to former levels.

Shows to date have included human performers such as jugglers, high wire acts, fire breathing and unicyclists.

Changes in licensing rules mean that within the next two years restrictions on the use of animals in circus performances will be lifted. The management team at Nimbus Circus are considering a project to introduce animals into the show to generate new interest. They are considering a variety of animals, including lions, tigers, monkeys, bears and snakes.

(i) List items which should be included in the written strategy document for this project. [4]

(ii) Discuss the operational and financial risks this project may introduce to Nimbus Circus. [9]

The management team are particularly concerned about the risk of animals becoming ill or injured which would prevent them being used in the show.

(iii) List the main options for mitigating this risk, and for each option give an example of how this risk can be addressed. [6]

(iv) Discuss the tools (other than insurance) which could be used to manage this risk. [7]

Two years after the introduction of animals into the show, the management team have decided to review the success of the project so far, to help them decide if animals should continue to be used.

(v) Discuss how the success of the project could be measured. [5]

[Total 31]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2013 Examinations

Subject CA1 – Actuarial Risk Management

Paper Two

Introduction

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

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

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

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

D C Bowie
Chairman of the Board of Examiners

January 2014

General comments on Subject CA1

This subject examines applications in practical situation 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 candidates who perform best learn, understand and apply the principles rather than memorising the core reading.

The examiners set questions that look for candidates to apply the principles specific to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. Detailed specialist knowledge is not required and nor is very detailed development of particular points.

Good candidates demonstrate that they have used the planning time well to understand the breadth of the question and to structure their answer – this 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 2013 papers

The general performance was slightly higher than in April 2013. Question 4 on paper 1 and question 2 on paper 2 were on average 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 (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 for pricing and reserving
- monitor any adverse trends in experience so as to take corrective actions
- provide management information

(ii) The basic requirement is that there is a reasonable volume of stable, consistent data from which future experience and trends can be deduced.

The data ideally needs to be divided into sufficiently homogeneous risk groups, according to the relevant risk factors. However, this ideal has to be balanced against the danger of creating data cells that have too little data in them to be credible.

Data would be split by age and gender and also by the year the annuity was taken out. The more recent annuities are more likely to be affected by the increased availability of impaired life annuities in the market and may experience lighter mortality. Also size of annuity

In practice the level of detail in the classification of the data depends upon the volumes of data available. The volume of data will indicate whether or not an analysis will produce meaningful results; it may be preferable to group data by age bands if necessary rather than date of commencement of the annuity. We have a large volume of data so a detailed level of classification is likely although at the extreme ages the data may be sparse

It will also be necessary to have data on the exposed to risk, divided into the same cell structure as the experience data. An analysis of experience is not valid unless experience and exposed to risk correspond.

The grouping will depend on the use of the data, in this case there was likely to be less competition several years ago and thus would be less relevant.

(iii) Monitoring of experience is fundamental to effective implementation of the actuarial control cycle.

The results of analysing the experience can be used to reassess the view of the future. This may result in changes to the assumptions or models used for calculating annuity rates or provision.

When analysing the results, LongLife can look into whether the period under investigation was typical and whether the experience is likely to be representative of future experience.

LongLife can use the results to see if their mortality experience is getting lighter. It is likely that annuities taken out many years ago are not representative of the company's current experience as they are likely to include a range of healthy and less healthy lives, although their mortality will still need to be monitored. The more recent annuities are likely to have a higher proportion of healthy lives and so will be more appropriate if future expected rates are being considered. This trend is likely to continue.

If it had not been possible to split the analysis into sufficiently homogeneous groups, it is important to consider whether the individuals to whom the investigation related are relatively homogeneous with the individuals whose benefits will be affected by future experience.

LongLife may then use the results as part of the assumptions setting process. However, depending upon the purpose of the assumptions, it may first be appropriate to make an adjustment in these assumptions to create a margin for prudence. This may allow for any uncertainty as to the validity of the results of the analysis.

The results can also be used as rating factors e.g. post code and annuity size

And they can be used to drive business strategy, e.g. whether to follow the competition by offering enhanced annuity rates.

Generally well answered especially parts (i) and (ii) but many candidates missed some of the basic bookwork. Better candidates commented on the importance of competitors offering enhanced annuity rates to lives in poor health and that the size of this market was increasing. Far too few mentioned exposed to risk and the need for consistency of this with experience data.

2 (i) Interactions between risks may mean that the effect of multiple risk events is greater or less than the sum of the individual risks. A practical technique needs to be developed to address this

Some risks, particularly operational risk, are still highly subjective in their assessment, particularly when it is necessary to construct a plausible adverse scenario that occurs at a very low probability. The temptation is to think of risk events that have occurred, which are therefore likely to be more common than the required ruin probability

Using past data to estimate future consequences of rare events need to be undertaken with caution – i.e. what is an assessment of a 0.5% probability for mortality etc.

A stochastic model would ideally need to be used to assess the impacts. If this model was to have more than two stochastic variables it will be impractical to run. Thus a means of assessing the correlation between the risks needs to be developed. The most common technique uses a correlation matrix. Populating the correlation matrix is a largely subjective exercise

(ii) Main risk is mortality being significantly higher than expected. I.e. more policyholders than expected die and therefore the company pays out more death claims than expected.

Or policyholders die sooner than expected resulting in significantly less premiums being received as well as having to pay out claims

Poor experience could be a result of a change in the underlying population, poor underwriting or anti-selection (or other valid example)

This would mainly arise from a catastrophic event (e.g. outbreak of global disease) or a concentration of risk such as a nuclear disaster or war in a particular geographic area. Although sometimes contracts specify exclusions from such events

Other risks such as expenses or lapses are unlikely to be so bad that they cause ruin. Unless an economic crisis results in a large number of lapses or significant increase in expenses

But legislative changes or operational risk might be a problem. For example an increase in reserving requirements or change in assets allowed (although the investment is unlikely to be so significant)

A very large increase in expenses, e.g. a mis-selling penalty or financial fine or fraud

Large scale fraud or investment failure

Reinsurance failure coupled with heavier mortality experience might also cause ruin

(iii) The whole enterprise is likely to use risk budgeting and by doing this maximum use can be made of diversification benefits, and thus the minimum capital be needed to support the risks undertaken

There is also the opposite of diversification, inverse correlation. For example there is annuity business in another part of the company

There will therefore need to have a system of risk reporting the allocations across the company.

The chief risk officer will need to ensure that all the products are using the risk allocation that they have been given and when looking at any back book transactions will need to be aware of the issues this might give for diversification and capital impacts

Some risks from the different products (like mortality from the term assurance and longevity from annuity business) might diversify away, but if one of the two products does not take on the risk exposure allocated this could actually increase the capital requirements of the company

This is also very important if any reinsurance or disposals are considered as this could also increase the overall level of capital required for the company

Risk exposures will not be matched, and additional capital may have to be held to cover the unbalanced risk taken on

Further risk management comes from management information such as claims and premiums analysis across the units, monitoring primary and secondary reporting systems

The least well answered question of the paper. In part (ii) few candidates focussed on ruin situations rather than possible loss making scenarios more generally.

3 (i) Costs for the different categories may have escalated differently over the period. For example, if claims management is carried out by professional staff whose salaries have risen faster than direct holiday costs such as air fares.

Claims volumes may have fallen while claims management staffing has not changed.

The mix of claims may have changed, either by size of claim or by category of damage/injury. For example, claims expenses as a %age of claim cost, may be lower for small claims that are admitted with minimal investigation. Or they may be lower for very large claims.

The company may have set thresholds for how claims are managed, for example only involve loss adjusters for claims above £500. If these thresholds have not increased in line with claims costs, then a greater proportion of claims will have exceeded the threshold and so incurred higher expenses.

This may be a deliberate result of spending more on claims management to eliminate fraudulent/excessive claims (and so reduce the overall claims ratio including management costs).

The company may have revised the way it allocates claims management expenses between lines of business, or has allocated more of its overhead costs to claims management.

Strengthening of currency if claims paid in foreign currency but mgt expenses paid in domestic currency. .

The level of excess has not changed and so more claims are over the excess level and hence being paid

(ii) The company can review claims dept staffing levels and remuneration.

…to ensure that these are appropriate to the volume and mix of claims

… and that operational efficiency is maximised.

The company can review claims management thresholds in line with inflation.

It could review the claims management structure in order to reduce costs, ensuring that these are proportionate to the need to identify fraudulent/excessive claims

The company could better use statistical analysis to identify fraudulent claims with lower management costs

Review policy terms and conditions, including the level of excess

(iii) Independent hospital charges would include their profit margins, and they may over-estimate treatment costs/requirements in order to increase their own profits.

The subsidiary chain might better check that treatments are linked to injury/accident sustained while travelling, rather than to pre-existing conditions that may not be covered

With a subsidiary chain, management controls could ensure high quality treatments and minimise costs, e.g. liaising across countries if treatment continues after the policyholder returns home.

Treatments could be carried out on a non-profit basis, or any profits could be paid to the company as dividends to offset claims costs.

There may be economies of scale with the existing hospital chain that can be shared between the travel/health businesses.

Claims management costs can be reduced because invoicing can be done directly and no need for management controls. And other examples such as economies of scale

(iv) This change to policy documentation would require disclosure to customers. Would it affect premium volumes or customer satisfaction?

Do the hospitals have the skills and resources to cope with the additional workload?

Does the chain have sufficiently wide coverage? It only operates in countries where the health insurance business operates, but travel will be worldwide, and even within countries injuries will arise while skiing/trekking/diving/etc in remote locations. Many travel insurance claimants will require emergency treatment and will be taken to the nearest facility which may not be one of the chain.

What arrangements can be made for areas where the chain doesn't have coverage and/or doesn't have the ability to treat these policyholders?

The company will need to establish procedures to allocate hospital costs between travel and health businesses.

Conflicts of interest for medical staff in that they are employees of the same company as the insurance company and want to keep the costs down but have a professional duty of care towards their patients.

Consider if the benefits outweigh the costs

Reasonably well answered but many candidates did not read the question carefully and in part (i) gave reasons why claims costs had increased when the focus of the question was on claims management expenses. Better candidates scored quite highly on parts (iii) and (iv).

4 (i) Immediate annuities purchased by a single premium could remove a liability to a current pensioner

The immediate annuities may be increasing at a fixed rate or increasing in line with a given index

They may continue after death to a surviving spouse, at either the full or a reduced amount

Deferred annuities could extinguish a scheme's liability to a member with an entitlement to a deferred pension

The annuity may have to increase in both deferment and payment, either at a fixed rate or at a rate linked to an inflation index. Schemes can have complexities such as differing levels of increases, Is it possible to match the nature of the scheme with an annuity

Longevity swaps could be purchased whereby the scheme pays a guaranteed level of payments to the insurance company in return for the insurance company to pay the actual payments that would be required to pay the members (i.e. the company takes the risk over and above the agreed level of payments)

(ii) As required the main advantage of these products is that they reduce the longevity risk

This would reduce long term cost uncertainty for the scheme and so reduce reliance on sponsoring employer's support.

For the immediate and deferred annuities it also removes the inflation and investment risk, depending on the financial product used

Longevity swaps still leave the scheme with the opportunity of making investment profits

The disadvantages of the immediate and deferred annuities are that:

- It removes the upside longevity, inflation and investment risks – however given the scheme wants to remove longevity risk it is only the 2 latter risks that are a disadvantage in this case

- The purchase price has to cover insurance company expenses and a contribution to its profit which may make the product relatively expensive

- Dealing with issues such as future addition of discretionary pension increases could become complicated depending on whether they remove all the risks when transferring to an insurance company (either way these issues could be complicated)

- Need to have liquid cash available

Longevity swaps still means the scheme has inflation and investment risk and will need to decide whether to cashflow match the payments to the insurance company or maintain the investment risk with the hope that they outperform

The market for longevity swaps may be in its infancy and thus hard to find an insurance company to enter into the swap with

There is counterparty risk with any such product.

Data issues. There data may well be old and there may have been changes to benefits so tying down benefits exactly may be a difficult exercise

(iii) <u>Merits?</u>

Uplift

- The scheme will reduce the tail risk where increasing longevity will be coupled with continual increasing benefits

- Still have the longevity risk for the individual member and there will be a cross over point where the scheme would win/lose from this transaction

Transfer value

- If the member took this option then the scheme will have reduced the longevity risk, and indeed all investment/etc. Risks and the individual will have removed their longevity risk

- But the scheme needs to pay out the enhanced transfer value now, and it will pay out more than the benefits would have cost in the case of a member who does not live longer than average

In both cases there are anti-selection issues, whereby members who are in poor health take the option.

- E.g. for the transfer value offer, because they can buy an enhanced annuity from an insurance company whereby they could get an increased pension,

- or for the pension uplift because they are just giving up future increases that they wouldn't have lived to receive.

- If the scheme is left with members who are in good health (and can't get a better deal elsewhere), it ends up with a worse longevity risk than when they started

The scheme will need to consider if doing either of these makes any further de-risking options more expensive in the future – e.g. will life insurance companies think that the scheme has been selected against and hence be more expensive by assuming lighter mortality for anyone who has not taken the offers?

How much will it cost to run the offers, including communications and administration?

And will the changes affect the ongoing admin of the benefits (e.g. for the uplift option will having some members having increases and some not cause the admin teams problems)

The scheme will need to consider how it funds the transfer value option and to a lesser extent the uplift option, what assets will it sell and does it have liquid enough assets to fund if the offer is successful

<u>Factors</u>

For both options the scheme will need to decide on how generous to be – this will probably depend on how paternalistic the scheme feels to its members

In both cases, the take-up will depend on how generous the offer is. There is an inverse relationship with generosity and take up, The smaller the uplift to the pension now (or enhancement to TV) the more benefit the scheme will see but probably a lower take up from the membership, the higher the uplift/enhancement the higher the take up would be BUT the lower the benefit to the scheme

The scope for enhancing the TV will depend on how prudent/otherwise the TV basis currently is

Targeting certain risk groups. The scheme will need to decide whether it asks for medical information before deciding the enhancement to offer, to reduce anti-selection risk, or whether to offer to just joint life policies – this would probably seem to be unfair and not filled in correctly if at all

If the members who have not retired are still working for the sponsoring company then the scheme will need to consider the impact on the members/employees if the deal offered is not seen to be fair or reduces their benefit security

Will need to know whether the company is prepared to put money into the enhancements to get a higher take up rate such that more longevity risk is removed

Funding level and whether the company can afford to will influence the generosity

Legislation may require that the members are able to get financial advice should they require it (such that the members know what they are giving up – e.g. benefits of increases). And therefore would want to take account of what the advice might be when designing the offers

For the transfer value option will there be an option to join a defined contribution scheme (either run by the company/scheme or another)

Will need to consider the tax issues before deciding on the structure e.g. if members accepting the offers might incur higher tax.

With both options the scheme will need to be professional and consider regulatory and reputational issues

The scheme should consider variations to the designs: for example to pay a guaranteed cash sum rather than a pension uplift.

Parts (i) and (ii) were often poorly answered – many unsuitable products were suggested and many candidates did not go into enough detail for the marks available. On part (iii) better candidates did actually discuss the issues rather than just raising issues that need to be considered.

5 (i) A provider is solvent if its assets are adequate to enable it to meet its liabilities.

(ii) Capital
Supervision (regulatory/statutory)
Disclosure

(iii) The main focus of the assessment will be around the risks that the business is taking on. It will also be interested in the probabilities of the risks occurring; and any correlations (diversifications of those risks); and any concentrations of possible risks

Will need to consider the impacts on capital of stressed events which could lead to other risks (e.g. Liquidity risk)

Need to ensure that the claims of the company can be paid – both the expected claims and the unexpected claims that it could have to pay under a 1 in 200 scenario

Will also need to understand the reinsurance contracts, and any other risk management tools, it has in place (the types of reinsurance in place and how much has been reinsured) and how this affects the solvency of the company. It will also need to consider the impact of a failure of the reinsurer and the impact that this would have on the solvency of the fund

The company will need to follow the Statutory requirements in doing the assessment i.e. regulation

The solvency assessment will need to consider the investments that the company has and in particular what the assets might do in certain scenarios. Will also need to consider how the assets are to be valued (and how subjective those valuations might be). The matching positions and correlations i.e. how the assets move relative to the liabilities in certain scenarios

The solvency assessment will need to consider how experienced the company is (established company versus new set up), and how much checking that will need to be done on the assessment

The NEW business volumes of each type of business will be important in looking at the assessment of solvency

Will need to ensure the correct tax treatment is used when doing the solvency assessment

The cashflows of the INFORCE business needs to be considered in the assessment - that is the premiums coming in and need to consider the expenses that are being paid out both in terms of acquiring the business and also expected ongoing expenses for administering the business (i.e. renewal expenses need to be part of the cashflows for calculating the best estimate liabilities)

If the company is writing new business then will also want to consider the capital that should be held if they closed to new business

Need to consider the operational risks as well in calculating the solvency assessment

(iv) An annuity provider's liabilities are long term in nature and therefore solvency measures are more important to ensure the provider can pay the annuitants.

The payments by the annuity provider are also uncertain in terms of timing, and amount (if index linked) – in particular the unknown length of time that the members will live

More uncertainty means more exposure to extreme events and higher potential shortfalls. The solvency capital requirements will aim to allow for this.

The building society's liabilities are known in terms of the savings accounts; and apart from the default risk the short term loan assets will be known (the timing will be set at the time of the loans). Therefore the solvency measures are unlikely to be as significant. As these loans are secured, the default risk is mitigated to some extent

(v) Analysts and rating agencies

Will be concerned with the level of capital held by the provider. Those with lower solvency may end up with lower credit rating

Brokers

They will not want to place business with companies that have low solvency, a poor reputation and low credit rating

Shareholders

They have supplied capital to the annuity provider and they will want a representative level of return on this capital. Stronger company, higher solvency level and thus more capital may be required

Policyholders

They have also provided capital in terms of premiums paid. They want the security, higher solvency, that their claims will be met as they fall due. In the case of the annuity provider the policyholder has/is retiring and will need prompt access to their annuity.

Competitors

If they see that you have low solvency and are weak there may be a take over bid

Employees and pensioners

Employees receive a salary from the provider and if there was a staff pension scheme then former employees who have retired will be dependent on the provider for their annuity. Again they will have more reassurance if the company is in a stronger solvency position

Regulator or policyholder protection groups

Will be concerned with the level of solvency capital held by the annuity provider to ensure that policyholders are safeguarded against future adverse experience

Professionals e.g. Auditors, actuaries and lawyers are responsible for signing off the accounts and possibly for the development of new products

Government and Society. Cost of bailing out in case of insolvency or general financial instability

Bond holders and creditors. Will want a company to remain solvent so that they receive their payments

Board

As well as ensuring policyholders are protected they want to ensure a good return for capital providers to the company

In parts (i) and (ii), many candidates gave more explanatory detail than required for the marks available, which may have given them less time to spend on other questions such as part (iii). On part (iv) many candidates focussed on the annuity provider rather than comparing against the building society. Part (v) was generally well answered.

6 (i) The objectives for the project

For example the desired impact on attendance

Statements on how the objectives will be met

The role of different parties in the project

Including management, existing performers and any new staff or associates required to introduce animals

The cost of the project

Details of how finances will be raised for the project (financing policy)

Policy for any legal or technical issues

Key milestones for reviewing the project including deadlines

Risk management policy

(ii) The operational risk is the introduction of animals into the Nimbus Circus entourage

Firstly need to find out whether these animals can be purchased for use in a circus or even better if they can be loaned

The animals will need to be fed which will mean having sufficient and appropriate food brought along with the circus

Housing animals will also take up significant space and require greater planning of the circus enclosure. Snakes are excellent escape artists.

Particularly if any animals are dangerous, protect staff, are likely to disturb others (e.g. noisy), or have particular requirements (e.g. need cool shaded areas) or liable to eat each other. Regular inspections to ensure adequate conditions

The performance area will need to be reviewed to ensure it is large enough for any animals being used

And that there is sufficient protection for spectators from dangerous animals

There may also be requirements to register any animals. Or to apply for permits to use potentially endangered animals. Beware fines for mistreatment etc.

Or restrictions on the numbers or types which can be kept for the circus

Considerations as regards what happens to the animals at the end of their working life, they can't just simply be sold

There may be a reputational risk that previous attendees are no longer interested in the circus following these changes, i.e. that the changes could decrease attendance. Especially if the previous animal ban reflects sentiment towards performing animals and cruelty issues. This includes disruption from animal rights protestors, increased security to ensure against this

Current performers might also be uncomfortable travelling with animals and decide they no longer wish to be part of Nimbus Circus

It is also unclear when the licensing rules will change, which means that planning which show animals will be introduced for may be difficult

The change may also encourage other competitors to introduce animals to their shows meaning there may be limited benefit for any changes

The two key financial risks are that the cost is higher than expected

Or the revenue generated is lower than expected

The initial cost for obtaining any animals may be higher than expected

The salary required for handlers or trainers may also be higher than expected

There may be an additional risk that any handlers or trainers may be in short supply and hence might be able to command higher salaries, higher salary increases, or leave to support other circuses

Transportation costs may be higher due to size and weight as well as need to transport animals safely

If any animals are particularly large or heavy this may create additional problems with transportation (e.g. giraffe and low bridges, or elephant and weight restrictions)

Some venues might place their own restrictions on the use of animals despite the change in the law

This might change the countries and/or locations where the circus can operate

There is a financial risk that finance cannot be raised by Nimbus Circus. This may be due to financial backers not being available, or banks being unwilling to loan on a risky venture

There may also be other constraints on the finances of the circus. This is particularly key as there will be a significant up front expense in obtaining any animals and the relevant equipment

There is a financial risk if any of the animals are injured or taken ill. This would expose the circus to (specialist) vets bills and inflation of those fees. Given the animals involved there may be a limited number of vets able to assist, which may command higher fees or place unexpected restrictions on locations the circus can operate in

(iii) Avoid the risk

Do not use animals in the show. Or use animals that require less specialist care and vets knowledge

Reduce the risk

Ensure handlers and trainers are appropriately trained to minimise the risk of injury to animals and to be in a position to administer basic first aid

Reduce uncertainty

Research the requirements and care for each animal before hand, and market research on what customers want. I.e. likelihood (frequency) of illness and then severity (amount of costs) if get ill.

Transfer risk

Hire handlers and trainers on the basis that they will look after the animals and always have one available for performance, effectively sub-contracting the care and costs of the animals. Or lease the animals (and handler) from a local zoo. I.e. not purchasing the animal but finding areas where there are local zoos and where a contract can be made to lease the animal

Insure the risk

Take out an insurance policy which will pay out if any of the animals are injured. This will involve transporting in a specialist vet or the animal to the vet. This will have complications given the potential size of the animal and that specialist vets are likely to be few and far between

Share the risk

Work with a zoo or animal organisation to use the show to promote awareness about specialist animals. The circus may not even have to own the animals, they could lease them from a safari park

(iv) Diversification

By introducing animals into the Nimbus Circus there is already diversification, as the existing acts provide diversification relative to the animal acts

Diversification could also be introduced by having a number of different animals available.

This could be animals of the same type, who could carry out the act if another was injured

Or of a different type so that there are a number of different acts available

Which would reduce the significance of a single act being withdrawn

Underwriting

This could effectively be health screening for the animals

It could include checking if the animals had been vaccinated or quarantined in an appropriate way

It could involve looking at an animal's medical history or pedigree to determine any predisposition to illness or injury. General research into this

This would require there to be adequate medical records

Which may not be possible if the animal is young, or has only been in captivity for a short while

Testing could also be undertaken, for example blood tests, to screen for common illnesses

However, for rare animals there may be little information available which may mean medical testing is unable to identify high or low risk animals of a given species

The activities undertaken in the show could also be screened

This would be equivalent to checking for dangerous leisure pursuits for life assurance contracts

Shows constructed in a safe way, or involving less dangerous activities would reduce the risk of injury to the animals

However, this could reduce the impact of the animals in increasing interest and revenue if the act was not deemed interesting or exciting by potential customers

Claims control procedures are not applicable as Nimbus Circus is not insuring the risk of injury. However there will need to be internal management procedures for spotting illnesses and getting the animal well again

Management control systems

Recording of animal illness and injury will help the management team identify any animals which are regularly unavailable

This might identify particular species or individual animals which are higher risk

And therefore provide information that can be used when choosing animals to join Nimbus Circus in future years

(v) The criteria will be whether the project has made a profit

And the variability of profit stream

This will require an assessment of the additional revenue brought in which will be difficult

… as changes in attendance will be influenced by many outside factors

For example the broader economic environment, or the success of competitors

As a basic measure this could simply be the value of tickets sold in the most recent year compared to tickets sold the last year before animals were introduced

This will need to be compared to the additional costs incurred

Both direct costs, such as licensing the animals and trainer wages

And indirect costs, for example management time, shared fuel costs or changes to publicity and marketing strategy

Amortisation – Large one off expenses (such as cages for animals) will need to be considered relative to the disposal value of those assets or the full working life.

The difference between expenditure and revenue will be the gross operating profit of the project

A further adjustment may be required for tax

The objectives in the strategy document will also confirm the success criteria for the project

This could include other non-financial objectives

For example, the level of press coverage and publicity obtained

Or greater success in particular countries or locations, even if offset by poorer performances elsewhere

Or audience feedback

Which may help establish whether initial results might have been better due to the novelty of a new act and thereafter it may become less profitable

Benchmark against competitors i.e. those without animals

This question was generally well answered, with some imaginative responses to the specifics of this project, although in part (iv) many candidates treated underwriting too briefly. In part (v), better candidates discussed how to assess the impact on profits and non-financial objectives.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

23 April 2014 (am)

Subject CA1 – Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven questions, beginning your answer to each question on a new page.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 Describe the likely cashflows and appropriate matching investments for the following:

(a) professional indemnity insurance contracts
(b) income protection insurance contracts
(c) critical illness insurance contracts
(d) a €1m prize which is on offer for proving an unsolved mathematical theorem

[8]

2 (i) Outline why a defined benefit pension scheme would want to calculate its provisions. [4]

(ii) Describe three different methods that could be used to allow for the risks in the cash flows for the pension scheme. [6]

[Total 10]

3 A large life insurance company has just completed its internal lapse experience analysis. The lapse rates are lower than for competitors with similar products (as shown in industry results). A director of the company has suggested that the internal analysis may not be correct and that the industry average lapse rates should be used instead.

(i) Discuss the reasons for the suggestion to use industry lapse experience and why this may not necessarily be a good idea. [6]

(ii) Describe the validation that should be carried out on the internal experience analysis. [5]

[Total 11]

4 (i) Describe how insurance companies and reinsurance companies manage the risks they decide to accept. [9]

(ii) Describe how risk classification can be used for the following:

(a) the design of a home insurance contract
(b) the pricing of a home insurance contract

[4]

[Total 13]

5 (i) Define an insurable risk. [2]

A general insurance company only writes travel insurance.

(ii) Discuss the areas of risk and uncertainty inherent in the claims experience of this insurance company. [7]

(iii) Discuss how pooling of risks could help the insurance company. [5]

[Total 14]

6 The shares of the following companies are listed on the stock exchange of a large developed country:

Company A: A large oil exploration, refining and retailing company. The company operates numerous drilling sites in many locations throughout the world. They supply a wide range of oil-based products to many worldwide industrial and individual customers.

Company B: A manufacturer of a wide range of consumer goods. The company has significant sales in the developed country with a smaller presence in other developed markets. For several years they have been making losses. They have recently closed most of their production plants in the developed country and re-located them to a fast growing developing country.

Company C: A security consultancy. The company specialises in supplying security advisers and personnel to overseas governments, companies and individuals. Most such personnel are former members of the armed forces of the developed country. The consultancy's business is generally short-term contracts with options to renew.

(i) Discuss for each company, the key factors that could have the most impact on the level of profits arising over the next few years. [10]

(ii) Suggest one external political shock for each company that could significantly affect (favourably or not) the expected level of such profits. [3]

(iii) Outline how a discounted dividend model could, in general, be used to place a value on an ordinary share. [3]

(iv) Explain for each company why the discounted dividend model may not be an appropriate method for valuing their shares. [4]

A large financial institution manages the equity investments of a wide range of clients from the developed country including pension funds and individual investors. The institution has analysed the shares of the above three companies and has concluded that they all represent good value with potential for high future investment returns. However, they have decided that none of the shares would be suitable investments for their portfolios.

(v) Explain why the institution may have decided not to buy each of these particular shares. [6]

[Total 26]

7 An insurance company is considering offering long-term care contracts. When an elderly person needs long-term care, the contract will meet the cost of care for the remainder of their life.

(i) Discuss the factors that will need to be considered in determining a suitable design for this product. [15]

(ii) Outline how the answer to part (i) may differ if the contract had a cap on the total benefits provided. [3]

[Total 18]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2014 examinations

Subject CA1 – Actuarial Risk Management

Paper Two

Introduction

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

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

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

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

D C Bowie
Chairman of the Board of Examiners

July 2014

General comments on Subject CA1

This subject examines applications in practical situation 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 candidates who perform best learn, understand and apply the principles rather than memorising the core reading.

The examiners set questions that look for candidates to apply the principles specific to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. Detailed specialist knowledge is not required and nor is very detailed development of particular points.

Good candidates demonstrate that they have used the planning time well to understand the breadth of the question and to structure their answer – this 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 April 2014 papers

The general performance was slightly higher than in April 2013. Questions 6 and 7 were on average 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 (a) The insured will be indemnified against legal liability resulting from negligence in the provision of a service. Cashflow (both claims and expenses) will be payable in the event of a claim, and there may be some delay before settlement.

The amount will not be known in advance; and it will be expected to increase with inflation. There may be additional inflation if claims are settled through court.

Index linked bonds may be suitable (although inflation link may not be sufficient) or high quality (low volatility) equities.

(b) Individuals will receive an income for themselves and their dependents in the event of the insured risk occurring. The most common insured risk is long term sickness or incapacity due to accident or illness.

Cashflows will be needed regularly over term specified in the contract; which may be quite long. These may be fixed or linked to inflation.

High quality (investment grade) bonds of a suitable term are likely to be suitable; fixed interest or index linked to match the contract.

(c) A cash sum will be provided on the diagnosis of a critical illness. The amount will depend on the underlying contract and is likely to be fixed at outset.

Contract term may be more than one year – in which case there will be continuing premium income and perhaps claims more likely towards end of term

Duration-matched fixed interest bonds would be suitable investments**.**

If the insurance was linked to a with profit life insurance policy, then a mix of assets could be held e.g. bonds, equities and property. This would reflect the reasonable expectations of the policyholders.

(d) Cashflow will be paid out on proof of the theorem. The amount is fixed; but the timing is unknown (uncertain) and may never be paid out.

It is not diversified over a pool of similar risks/policies.

The €1m may be held in a secure cash investment; but care will be needed to ensure that this amount does not fall below €1m. Derivatives could be used for this purpose.

May hold less than €1M to anticipate interest before likely claim date, and accept risk of need to top up.

It may be possible to hedge this event.

A range of scores. Some candidates didn't comment on investments or didn't go into sufficient detail.

2 (i) The reasons for a pension scheme calculating the provisions include the following:

- To determine the liabilities to be shown in the scheme's published accounts and reports (regulatory purposes)
- To value the scheme for merger or takeover
- To determine the excess of assets over liabilities
- e.g. to inform sponsor of any shortfall that will need to be made good (e.g. contribution plan update)
- To value benefit improvements for the scheme and whether any discretionary benefits can be awarded (e.g. one off uplifts)
- To calculate discontinuance/surrender benefits
- To influence investment strategy
- To provide disclosure information for beneficiaries
- To consider other options for the derisking of the scheme e.g. experience analysis used to identify risk variance.

(ii) There are 3 main methods of allowing for risk in cashflows

1. Best Estimate plus Margin for economic and non-economic assumptions

   An approach to the uncertainty surrounding benefit costs may be taken by using assumptions that do not reflect an actuary's best estimate of future experience.

   A risk margin is built in to each assumption starting with the best estimate assumptions together with an explicit margin for caution – / e.g. a reduction to the qx in respect of mortality.

   Assessment of the necessary margins depends on the risk involved and its materiality to the final result and the risk appetite of the schemes trustees.

   Where a risk factor has been stable over many years and is not exposed to economic events, it may be reasonable to add a simple percentage loading – e.g. younger age's mortality might be relatively stable

In other cases a more detailed analysis of experience for various sources, perhaps using a stochastic (or other) approach may be needed (e.g. inflation linked liabilities)

2. Contingency Loading

This approach is to increase the liability value by a certain percentage (could be arbitrary).

The choice of this loading is effectively another assumption; and should ideally reflect the degree of uncertainty that exists. It would therefore be expected to increase with the value of the liabilities but not in proportionate manner.

3. Discounting cashflows at a risk premium

This is the traditional discounted cashflow approach where the cashflows are assessed on a best estimate basis; and then discounted at a rate of return that reflects the overall risk of the liability

The choice of discount rate is critical and should reflect the general level of uncertainty

Part (i) was generally answered well, however, a number of candidates focussed too narrowly on the different accounting-type purposes rather than the broader range of uses for a valuation. On part (ii) most candidates identified the three methods to allow for risk, and better candidates went beyond this to explain how the size of the margin should reflect the level of uncertainty and the purpose of the valuation.

3 (i) Both the company and industry data are large datasets so credible.

Depending on the product the higher lapses may be more or less prudent.

Need to consider the use of the results and whether this use requires prudence.

Regardless of the prudence, if the internal results are wrong then they should not be used.

Using industry experience instead would mean using a higher lapse rate assumption. So consider the implications of using a higher lapse rate than reality.

For regular premium contracts, higher is more prudent early on in the contact term – when the initial expense of setting up the policy has not been covered by the premiums received This would not be the case for single premium policies.

Depends on whether the contract has a surrender benefit, and whether there is a guaranteed minimum. If there are guaranteed minimum surrender benefits.

then higher lapse are more prudent. However, if there are no surrender benefits, or the policy is single premium, the company will make a profit on lapse and so a higher assumption is less prudent.

Consider the impact of PRE on surrender pay-outs.

Need to consider the use of the lapse assumptions.

For pricing need a realistic assumption with some margin in case experience is not as expected. I.e. the assumption should be based on the actual company experience and not industry. Unless there has been a significant change that could mean future experience is significantly different.

For reserving purposes need to use prudent assumptions. Depends on the basis the company produces reserves.

Also consider whether there are good reasons for company's experience differing from industry; e.g. different sales channels, customer base, time lags etc: if there are then using the industry results is less likely to be suitable.

(ii) Data integrity

Ensure basic validity checks on the data.

Check that the data received from the accounting department ties up with that from the admin department i.e. that the policy did exist and the premium that should have been received.

Check the latest valuation results: in-force at start of the period + new policies written during the period – policies lapsing during the period = in-force at the end of the valuation period. This needs to be done for each major product class and underwriting year.

Check if the results, and raw input, for the report are consistent with that in the previous report.

Check the data for the report reconciles with that in other reports e.g. supervisory returns, published accounts.

Correct and consistent exposure and claims counts

Check that the policies are correctly classified as lapsed based on when premium was last received.

Check whether there was an option to have a shorter premium paying term than the policy is on risk for.

Check for potential distortion to the results due to timing when experience data has been taken from, for example number of policies in premium grace period that have not paid premiums.

Check for any clustering of dates, was it a leap year that the policies were written and the next they were shown as lapsed etc.

Check that there is consistency/correspondence between exposure and claim data

Validation of process and results

Check the data transfer manipulation process i.e. the raw data may be correct but in calculating the output for the report there may have been an error, for instance lost data

Check the grouping of the data

Are the actual lapse consistent with those that were expected?

Check that lapse rate measure e.g. policy or premium weighted lapse rates, is consistent with the industry experience lapse rate measure.

Analyse the drivers of the lapse rate, for example by underwriting class, sum assured band, premium size band, entry year, distribution channel, calendar year, etc. This may help explain changes in experience and difference with industry.

Check the analysis of surplus.

Check for changes in the mix of business e.g. sum assureds, ages.

Most candidates scored reasonably well on part (i) but some candidates didn't consider how the analysis may be used so missed several marks. Again on part (ii) many candidates didn't apply their answers to the specifics of the question, referencing general data checks not relevant to the data in question.

4 (i) The main tools available for risk management are:

- diversify the risk away
- implement control measures that reduce the likelihood of the risk event occurring
- implement control measures to ensure that the price paid for the risk is fair
- implement control measures to mitigate the consequences of a risk event that does occur
- transfer the risk

The insurance company can diversify their risk by marketing a wide range of different products of different sizes insuring a wide range of risks. There

should also be a good mix of business. They can also diversify by geographical area. Their investments can be diversified by asset class and within each asset class. They can also diversify by reinsurance providers.

The reinsurance company can diversify across a large portfolio and deal with a wide range of providers. They can also diversify by geographical area and assets.

Outsourcing e.g. of administration functions can be used to transfer the risk and therefore to reduce the uncertainty/volatility.

The insurance company can reduce the likelihood of some risks occurring by the terms and conditions in their policies (e.g. all doors and windows must be locked when away from property for household contents policy), or premium structure (e.g. lower premium for no claims gives incentive to policyholder).

The reinsurance company could impose terms and conditions on the cedant if appropriate.

They can both implement control systems to reduce the likelihood of operational risks such as financial fraud.

It may be possible for both to contribute to public education campaigns to reduce risks of certain events.

The insurance company can ensure the price paid is fair by underwriting prior to the acceptance of risk. This should identify risks for which special terms will need to be quoted. Adequate risk classification will help to ensure that all risks are rated fairly.

It may be harder for reinsurance companies to price some of their contracts as there will be limited data on some risks (e.g. low probably high impact). Will need to investigate, may be possible to use some historic data.

The reinsurance company can check the quality of the insurance companies' practices to ensure they are as expected.

The insurance company can mitigate the consequences of a risk by using claims control procedures. This should guard against fraudulent or excessive claims.

Management control procedures can be used to monitor the liabilities and so the potential adverse risk events (for both companies). Will need to hold good quality data; have good accounting and auditing procedures. Care will be needed over any options and guarantees offered.

(ii) (a) The first stage of risk classification in the design of a contact is identification and documentation of the risk characteristics involved.

This will include risks relating to individual policies; i.e. the proposer and the home being insured, and risks aggregating over the whole portfolio of policies.

For each risk the provider will need to decide which risks it is prepared to:

- take on and keep
- take on but lay off; e.g. through the use of reinsurance or alternative risk transfers
- refuse

For those risks that are taken on and covered within the contract there is a decision required on the extent that the risk will be accepted.

Having decided on the risks to retain, the provider may change the product design.

(b) When pricing the contract it is necessary to translate the risks into risk factors that can be used to measure the frequency and severity of the risks so that the premium for each policy reflects the risk being taken on, by using suitable rating factors such as postcode, property size etc.

There was a wide spread of marks gained from part (i). Better candidates gave a well-structured answer identifying first the key broad areas of risk management and then elaborating on each. However, most candidates focused on the direct insurer, with few candidates identifying the different points and issues for reinsurers. Part (ii) was generally not answered very well. Most candidates appeared to consider the risk under the home insurance as pre-determined, rather than it being the insurer's decision to decide what risks to accept under the contract, the extent they are accepted and whether they will be retained or reinsured.

5 (i) For a risk to be insurable:

The policyholder must have an interest in the risk being insured; to distinguish between insurance and a wager.

A risk must be of a financial and reasonably quantifiable nature.

The amount payable by the insurance policy in the event of a claim must bear some relationship to the financial loss incurred.

In most countries individuals are deemed to have an unlimited insurable interest in their own lives and that of any spouse.

(ii) Risks and uncertainty will arise both from the outcome of the business already written and in the determination of premiums to charge in future periods.

Claims

Travel insurance claims are subject to wide variability in amount and frequency, and will probably vary depending on locations (for example medical costs will vary, some airports maybe lose more baggage etc.). Changes in claims costs year on year may be due to changes in the underlying risk or merely random variation.

As the insurer only writes travel insurance there is no opportunity to cross subsidise with classes at different stages of the cycle.

Variability will also exist in terms of cost of handling claims.

Operational risks in relation to its business processes; e.g. IT failures on its claims helplines.

Delays from occurrence to notification, or from reporting to settlement result in uncertainty regarding the ultimate cost of claims.

Changes in Cover

If cover is added or deleted from the travel policies there probably won't be sufficient data to make a reliable estimate of the impact of the change.

Characteristics of Policyholders and travel locations

If the company is aiming to attract different risks to those that it has historically held the claims experience may differ from the past. It is difficult to determine how the claims will change. There may be opportunities for anti-selection if the premiums do not reflect the risk across the range of business written correctly. If the majority of the contracts issued are those where the rates are inadequate, this anti-selection will result in losses.

The travel destinations exposure is less likely to be known for annual policies.

Increasing Hospital Costs in overseas countries (Inflation)

The costs of medical care abroad might be increasing faster than the insurance company expects and hence may need to pay out more than expected. Also individuals may not recover quickly depending on the standard of the care in individual countries (and this will vary by country).

Fraud Rate

Individuals might declare goods in their luggage that they didn't have and hence increasing the pay-outs.

Legislation

There may be fiscal changes in tax or the cost of medical care abroad. There may be changes in cover. There may be a change in the restriction of factors that can be used in underwriting.

Catastrophe

A natural catastrophe or outbreaks of illnesses in individual countries could lead to many claims – but will be relative depending on the number of visitors to that country.

The company could be exposed to writing business to people who have similar characteristics (and holiday destinations).

Currency Risks

The medical costs (or emergency replacement of luggage etc.) are likely to be in a foreign country, so this exposes the company to risks of fluctuating currencies.

Reinsurance

This is subject to uncertainty as the company might not appreciate the scale of the risks and purchase inadequate reinsurance. It may have doubts about the value for money and the availability of reinsurance.

The ability to make a recovery will depend on the solvency position of the reinsurer.

Policy Wording

This must be precise so the only claims paid are those that the company intended to provide cover for.

(iii) The purpose of pooling risks is to increase the number and diversity of risks with the aim of increasing the certainty of the aggregate total claims cost.

Ideally risk events need to meet the following criteria to reduce the volatility of the risk profile:

- Individual risk events should be independent of each other.
- The probability of the event should be relatively small.
- Large numbers of potentially similar risks (e.g. main European countries) should be pooled in order to reduce the variance and hence achieve more certainty.
- Low variability in individual event cost, and amount of event cost.

- Moral hazards should be eliminated as far as possible because these are difficult to quantify.

- There should be sufficient statistical information to enable the insurer to estimate the risk and its likelihood occurrence.

However the desire to write business means that the insurer may provide cover when these ideal criteria are not met.

For countries where there will not be many people travelling the risks of loss are probably higher due to the lack of pooling within the business and hence the maximum limit is probably the key point.

A policy may cover groups of individuals so there is a likelihood that the risk events will not be independent, so limiting the benefit of pooling.

The insurer could increase the pooling of the risks through reinsurance, for example, reciprocal quota share insurance with another travel insurer to increase the spread of risks exposed to, excess of loss reinsurance where the reinsurer pools low likelihood, high variability claims across insurers and reducing the individual claim variability of retained risks.

Part (i) was generally done well. Part (ii) was reasonably well answered although only the best candidates covered the wide range of topics. Part (iii) was not answered well by most candidates who didn't seem to know the bookwork or consider how pooling could be used for travel insurance.

6 (i) Currency volatility can affect profits over the next few years if this risk is not hedged or managed.

Changes to tax rates or the why they are levied will have an affect on post-tax profits.

Oil Company

The most important factor will be the real (net of currency issues) price of oil.

Assuming that the company owns oil reserves, a rise in prices means that it assets are worth more. That is, it can sell its products for higher prices without a similar increase in costs. This is because its costs will be less volatile than its revenues.

The impact will be less significant if it produces oil on licence. However, any fee may be linked to the price of oil.

The price of oil will be driven by supply and demand.

In general supply will be relatively known in the short term (especially if existing supplies are being exploited at close to full capacity) as it takes a long

time to develop new fields. This implies profits predictable if oil price is stable.

Hence demand will be the key driver on profits and this will be closely linked to overall world economic growth. However, demand from developing or industrialising economies may have more impact than that from mature economies.

Prices are likely to be more volatile than pure supply and demand imply due to the action of speculators trying to take advantage of future economic and other developments.

Profits will also be affected by operational risks and the way the company develops its own reserves, e.g. better than expected yields would boost profits, or a disaster cutting supply would reduce them.

Consumer goods manufacturer

The most important factor will be the demand for its products from the developed country.

Spending on consumer goods will be broadly discretionary (in terms of timing) or non-essential. Hence the level of economic growth in this country will be the major driver of demand. In particular, low interest rates and low unemployment will boost consumer spending – especially if there is also asset price inflation (shares or houses).

However, its market will be competitive and so demand for its products will crucially depend on relative prices v the competition and on fashion trends.

Will the decision to move production overseas will cut costs and hence prices sufficiently to boost its market share profitably? Also will the company be able to maintain quality/reputation?

The exchange rate v the currency of the production country will be very important. Low costs there could be offset by an appreciating currency.

Likewise costs, especially wages, could increase significantly in the developing country along with other operational risks.

Security consultancy

The most important factor will be the demand for its services.

In general, there will always be an underlying demand for security personnel and so general economic uncertainty or worldwide instability may not be crucial.

However, wealth creation in developing countries may boost demand significantly. Such countries may not have adequate or reliable law

enforcement systems in place so it may be better for people to make their own arrangements with external consultants. Such countries will also need advice on setting up their own security or policing systems.

Profits will be influenced by the company's ability to get and maintain contracts. Hence its reputation and recent performance will be crucial. This will depend on the quality of personnel it can recruit especially leadership on the ground.

Overall supply of personnel will matter. But, contacts and an ability to offer attractive terms and conditions will matter more – especially relative to any competition.

(ii) *One example for each required*

Oil Company

A decision by a group of producers to restrict supply e.g. OPEC would seriously affect the price of oil and hence profits. This may not be favourable e.g. if demand fell or if the affected area was where the company obtained most of its supplies.

A decision by the government of a major consuming country to raise (or lower) tax on oil products could seriously affect demand. This would be especially true if alternative energy sources were available or encouraged.

Consumer goods manufacturer

A decision by a the government of the developed country to impose high import tariffs on consumer goods manufactured abroad would increase prices and so seriously reduce demand.

A change in government in the producing country could lead to increases in costs if pro-worker legislation were to be introduced e.g. minimum wages, maximum working hours or health and safety policies.

Security consultancy

A decision by a powerful country to invade a smaller country would greatly increase the need for security personnel from both sides. Similarly, large conflicts between any countries would also boost demand.

Another major country significantly reducing its armed forces would increase the supply of security personnel. If this company didn't have relevant contacts, it could be undercut or priced out of contracts by better-connected rivals.

(iii) This model derives the value of a share as the discounted value of the expected future dividend stream. Hence it will be necessary to estimate future dividend payments.

Current (or recent) dividends can be projected into the future.

Alternatively, profit forecasts for the next few years could be used for short-term dividend estimates with the general projection kicking in later.

The required rate of return (real or nominal) would usually be calculated as the yield on a long-term government bond plus an appropriate risk margin.

Allowance would need to be made for the tax status of the investor e.g. using net dividend income.

(iv) It is difficult to determine the risk margin for discounting the future profits.

The discounted value of profits may be sensitive to profits/dividends in the long term where there is greater uncertainty making the valuation less reliable.

Oil Company

Given the volatility e.g. demand and currencies, it will be very difficult to project future profits/dividends.

The company will derive its profits from its oil reserves (current and future) i.e. it will have large stocks.

Hence the company could be valued in a similar way to a property company (it will have significant – if unique – property assets) by looking at net asset value. That is, the asset value can be projected on a range of future oil prices (allowing, possibly, for related supply and demand consequences).

Consumer goods manufacturer

Given that the company has been making losses, there may have been no recent dividends to base projections on.

The company is making significant changes to its operating model and so any past data, if available, may not be useful.

There are likely to be competitors using similar approaches and so a comparison of key operating factors may help with relative valuations.

In this case, such relative factors may revolve around production costs (allowing for currency) or quality of product (e.g. brand strength).

Security consultancy

Here the problem may again relate to volatility e.g. in a fast changing market. It is likely that the company could change a lot in the short-term as the needs of clients and the political climate could vary greatly (demand for services)

The company could alter the scale of its operations quickly so making projections relatively meaningless. Accordingly, it may be difficult to find similar companies for comparisons.

The company will have few tangible assets. Its primary assets will be the people it employs.

Hence valuations will probably be very subjective based on an assessment of the abilities of senior management, their contacts, and their ability to generate business and adapt to changing circumstances.

(v) If the institution already holds similar stocks in its portfolio, it may reject the stocks on grounds of diversification. That is, comparables may offer better returns.

All of these stocks could be viewed as risky and so may not suit the institution's risk appetite. In particular, the institution may be seeking relatively low volatility e.g. stable dividend flows i.e. it is selling itself as a prudent manager.

It may view the stocks as too illiquid to invest in.

However, the important points are likely to revolve around the wishes of the institution's clients.

The institution is not investing its own money, it is managing other peoples' money on their behalf. The institution is likely to have voluntary or ethical restrictions based on perceived preferences of its clients.

In this case, the ultimate investors are members of pension schemes and private individuals – based in the developed country. They may have strong views about how their money is invested.

Each company has features that may mean that such investors would not want to be associated with them and hence the institution may choose not to invest. In particular:

Oil Company

Reservations here could be down to environmental or green concerns. As oil products are associated with high carbon emissions some investors may not wish to invest.

Such fears could be exacerbated if there has been a recent high profile environmental disaster linked to the oil industry (or specifically this company) e.g. a large oil spill.

Alternatively, high oil prices may be linked to general recessions (and certainly high fuel prices). Excess profits may sit uneasily with the general population who may be struggling to cope. This may cause public relations

problems for the institution (at the trough of a recession, future oil prices may be expected to fall – hence share prices may have peaked).

Consumer goods manufacturer

Issues here could be to do with the closure of domestic plants and a transfer to overseas production. This policy will lead to domestic job losses and could be very unpopular – won't invest in a company that sells out our people etc.

In particular pension scheme funds may be influenced by employee or union representatives who would not wish to be associated with investment in companies that lay off lots of workers.

Such transfers of production are often associated with tax avoidance (especially if past losses are involves). If successful, they may also involve large bonuses for senior management. Again such outcomes would be very unpopular with "ordinary" people.

Security consultancy

Here the problems will focus on merchants of death arguments. Many investors will not wish to be associated with companies who seem to employ mercenaries.

This will be a particular problem if the company is associated with unpopular regimes or factions or has been involved in incidents connected to civilian casualties.

Given the importance of senior management, a particularly notorious high profile individual may put off investors.

Candidates' answers to part (i) were often narrow, also many candidates discussed factors that might affect profits over the long term rather than over the next few years as per the question. Most candidates scored well on part (ii), relating points to the specifics of the 3 companies mentioned rather than making more general comments. Part (iii) was surprisingly poorly answered for straightforward bookwork. Part (iv) was also not well answered with many candidates commenting only on general drawbacks of the model and not on its application to these companies. Many candidates approached part (v) only from the perspective of underlying investors, rather than the large financial institution and its own objectives.

7 (i) Characteristics of the parties involved

The potential policyholders are individuals considering care costs in old age. They may be older (this event may be in the foreseeable future) or younger (this is part of their general financial planning).

They will want the product to meet their needs in a cost effective manner. Their needs will be influenced by their capacity to pay, the risks to be covered (the benefits that are needed) and their attitude to financial risk.

The insurance company will also want the product to be cost effective. They will be influenced by the capital they have available and the expertise available as well as the chosen market.

The product design also needs to be deliverable from point of view of administrators, legal, etc.

Customer risk appetite

It is important that the long term care contract meets the risk profile of the intended purchaser; and that the risks and benefits involved in the product are clearly explained to them.

Sales will be optimised if the product can be designed to be suitable for customers with a wide range of risk appetites.

For this contract, covering the full cost of care will be suitable for a policyholder wanting low risk although this is likely to be expensive.

Could provide a cheaper product if demand is sufficient. E.g: for a policyholder willing to accept more risk for a cheaper product, the contract could cover a fixed proportion of the cost of care, pay cost of care after a certain amount or the payments made may be capped.

Level and form of benefits

The level and form of benefits will depend on the legislative framework: e.g. what benefits the state would provide (if any).

Direct provision of benefits versus cash amounts. The contracts could pay for all the costs of care throughout the remainder of life, or could provide a cash lump sum or an annuity to contribute towards the costs of care. With direct provision, will the insurer restrict the choice of care provider?

The cost of care will increase over time so will need to be taken into account either the level or form of the benefits.

Direct provision may be better if the insurance company has a relationship with a benefit provider.

Any options or guarantees

Any options or guarantees will need to be charged for.

There may be options to change from one form of benefit to another. There may also be guarantees (e.g. on discontinuance).

Benefits on discontinuance

Any discontinuance benefits should be fair to the policyholder discontinuing their policy, other policyholders and the insurance company.

This may be problematic if policyholders try to discontinue when (e.g.) they have a terminal illness that does not require long term care.

Methods of financing benefits

This is likely to depend on the form of the premium. For single premium policies, the benefits will be funded in advance. For regular premium policies, a fund will build up gradually – would premiums continue to be paid in the event of a claim?

Choice of assets

For the benefits that are funded in advance, these funds will need to be invested. The investment will need to be suitable for the form of benefit and the risk attitude of the stakeholders. Low risk assets that are expected to increase in line with inflation are likely to be suitable.

Reinsurance

The benefit design needs to be consistent with the term and conditions that a reinsurer requires to accept reinsurance of the risks.

Charges to be levied

The charges that are levied will need to meet the costs incurred by the insurance company in setting up and managing these contracts. They will include:

- contract design and advertising
- sales commission and the administration of setting up new client records
- the ongoing administration of collecting contributions/premiums etc. and paying the benefits as they fall due and management of assets
- the profits and overheads of the provider e.g. rental of office space, IT departments etc.

Capital requirements

The capital requirements will depend on the how risky the contracts are likely to be. This will need to be taken into account when designing the contracts.

The company has no experience in this nature of business and so capital requirements are likely to be higher.

Underwriting at inception

The premium and/or level of benefits will need to depend on the initial underwriting.

Claims Underwriting

Staff from the insurance company will need training in underwriting. Especially at the claims stage in assessing the severity of the case and the level of future care needed. This may be sensitive with potential adverse PR if claims are rejected

Tax and regulation

Are there tax incentives for particular benefit formats, or regulations e.g. on sex/age discrimination?

(ii) The level of benefits would change if there was a cap. It may also influence the form of benefits.

The risk to the insurer is lower; and so their capital requirements will be lower. This may lead to lower premiums.

The policyholder will know the maximum benefit in advance but they will take on the risk that this may not be sufficient for their needs.

There may be more competition with this product. It is also possible that individuals would prefer to self-insure if the maximum amount was low relative to the assets they held.

If the state picked up costs above a threshold then the policy could provide benefits up to that level.

A wide range of scores. On part (i), good candidates identified that the number of marks on offer required broad discussion and elaborated on the details behind points rather than simply listing. Part (ii) was slightly better answered.

END OF EXAMINERS' REPORT

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

23 September 2014 (am)

Subject CA1 – Actuarial Risk Management

Paper Two

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven questions, beginning your answer to each question on a new page.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 (i) Define credit risk. [1]

(ii) Describe the principles fundamental to good lending. [5]

[Total 6]

2 An insurance company has been writing a high volume of conventional motor insurance for a number of years.

In recent years, there has been a substantial increase in journeys made by trucks transporting heavy machinery along cross-country routes to remote locations. There are currently over twenty such routes/locations. The trend is expected to continue in future.

The insurance company has decided to develop an insurance product specifically targetted at this market, to provide cover if a truck breaks down or has an accident. The insurance cover will pay for repairs at the roadside or, if this is not possible, it will pay for the truck to be taken to an approved repair centre.

(i) Outline the risks this new product could introduce for the insurance company. [6]

(ii) Discuss the extent to which some of these risks could have their impact reduced through diversification or through alteration of policy terms. [5]

[Total 11]

3 A small general insurance company currently sells only one line of business. The company's strategic plan is to grow rapidly by acquiring other insurance companies.

The company's owners have identified a target company, and now wish to determine an offer price for the target.

(i) Outline the requirements of an actuarial model to place a value on the target company. [7]

(ii) Discuss why the owners may offer a different price to that suggested by the model. [3]

(iii) Discuss why the company may be able to operate more efficiently after completing the acquisition. [2]

[Total 12]

4 A general insurance company intends to launch a new product. It will cover policyholders for medical costs arising from an accident.

Describe how to determine the premiums for this product, including the process of collecting data and setting pricing assumptions. [13]

5 (i) Outline what is meant by Scenario Analysis, Stress Testing and Stochastic Modelling. [3]

(ii) Suggest, with reasons, which risk evaluation method in (i) is most appropriate for each of the following situations:

(a) market crash impact
(b) individual company capital assessment review
(c) valuation of a portfolio including guarantees

[3]

(iii) Discuss the use of a standard model for determining an insurance company's Solvency Capital Requirements compared with an internal model. Consider this from the perspective of:

(a) an insurance company.
(b) a regulator.

[10]
[Total 16]

6 (i) Outline the main features of an investment trust. [4]

An investment trust specialises in investing in unquoted equities and unquoted bonds.

(ii) Discuss the attractions of this investment trust to an investor. [3]

(iii) Describe how the investment trust might value its unquoted investments using cashflow techniques. [7]

Over the past six months there has been a rise in the main stock market index for the country where the investment trust is based, but over the same period the value of the investment trust's assets has fallen.

(iv) Discuss possible reasons for this difference in performance. [3]
[Total 17]

7 A defined benefit pension scheme is in the process of being wound up following the insolvency of the sponsoring company. The scheme was in surplus at the time of the insolvency. The scheme's membership comprises about 30% pensioners who have all retired in the last three years and about 70% deferred members who on average have twenty years until they reach retirement age.

(i) Discuss the issues and choices that will need to be considered by the scheme's trustees. [11]

An insurance company has been approached to provide the benefits exactly as in the scheme rules in exchange for a single initial premium.

(ii) Discuss the risks that the insurance company would be taking on. [8]

(iii) Outline the management tools that could be used to control these risks. [6]

[Total 25]

END OF PAPER

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2014 examinations

Subject CA1 – Actuarial Risk Management

Paper Two

Introduction

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

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

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

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

F Layton
Chairman of the Board of Examiners

December 2014

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 candidates who perform best learn, understand and apply the principles rather than memorising the core reading.

The examiners set questions that look for candidates to apply the principles specific to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. Detailed specialist knowledge is not required and nor is very detailed development of particular points.

Good candidates demonstrate that they have used the planning time well to understand the breadth of the question and to structure their answer – this 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 2014 paper

The general performance was slightly higher than in April. Questions 1 and 7 on paper 1 and question 7 on paper 2 were on average 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 (i) Credit risk is the risk of failure by third parties to repay debts [1]

(ii) *Character of borrower (and/or its principals)*
Who introduced them? Can references be obtained?
Track record? E.g. if borrower is found to have lied (or intentionally misled) do not lend.
Do key personnel have the required depth and spread of skills and experience?

Purpose — to what use will the monies be put?
Is the project acceptable on ethical and moral grounds? Is the borrower in a sector where there are concerns?
Will the lending be subject to country, currency, environmental, resource, technological, or other inherent risk?
Are there controls to ensure that the monies are correctly applied?

Amount — is the amount to be borrowed reasonable?
Does it fit with the stated purpose?
Any contribution by the borrower? Who stands to lose if the project fails?
Is the loan an acceptable risk to me, given my risk tolerance, other exposure, etc.?

Are repayment terms acceptable?
Can the borrower service and service the debt when due?
How certain is the source of repayment? Security and ability to repay
What margin of safety has been built into the projections and assumptions?
[5]
[Total 6]

Candidates generally scored well on this question, although many didn't give sufficient detail on part (ii) for the marks available.

2 (i) Inexperience dealing with trucks and the transport industry will add to uncertainty and risk

As the current portfolio is for conventional motor insurance a repair / recovery contract will be outside the current expertise of the company

This will introduce operational risks

There will be little or no data on which to price insurance (e.g. identifying rating factors), either on the volume of breakdowns/accidents or the cost of repairs or recovery

This risk is higher because the industry is currently developing; and therefore past data held by third parties may no longer be valid

Particular routes may have increased or specialist hazards which would need to be understood

Maybe relatively high likelihood of breakdown because of the heavy machinery

There may also be an increased concentration risk if there are a limited number of truck operators

There will be a reputational risk if the terms of the policy are not understood. E.g. delays in recovery, claims being refused

There may be exposure to moral hazard from the truck operators, as incentive to get maintenance paid for by the insurer. Also moral hazard for companies carrying out the repairs or recovery, which if insured could lead to inflated costs and therefore inflated claims

Risk of Competitors introducing similar breakdown packages

There may be a political risk as a policy change could reduce journeys back to former levels

There is also a risk of political intervention if this new product becomes subject to any additional regulatory attention

Given uncertainty over business there may be financial strain due to the capital requirement both setting up, and financing this new business line

[6]

(ii) It may not be possible to diversify/reduce the political risks as any business relating to this industry will be subject to those risks

Risks introduced by lack of data will also be difficult to diversify

The main source of diversification will be the current portfolio, which is large and therefore should mean the risk from this new product is less significant for insurance as a whole

For this policy it is possible to diversify by placing business across a number of different operators/drivers, which may reduce the impact of specialist hazards on particular routes

Policy terms could reduce claim volume and uncertainty and moral hazard risk.

- E.g. only covering cost if an approved mechanic is used
- Or only paying out if vehicles are properly maintained (e.g. no payment of repair is due to poor maintenance). Adequate driver training and adhering to health and safety regulations
- Or setting maximum pay outs for particular repairs, or maximum pay outs per policy
- Or use of policy excess, or pricing with no claim discount

But need to balance stringency versus marketability

This product will require a different type of claims underwriting to the current portfolio

Another way of diversifying risk may be to consider use of reinsurance, for example quota share, although this would come at a price and reduce overall profitability

[5]
[Total 11]

Some candidates appeared intimidated by the unfamiliar setting and so missed out on key points such as this being outside the insurance company's experience. In part (ii) many candidates didn't focus on the issues raised in the question, in particular saying little about diversification.

3 (i) Valid
Rigorous enough for the purpose
Adequately documented
Capable of reflecting the risk profile of the business
Parameterised to show sensitivity to key features – including failure to renew, low business volumes – and may need to be stochastic
Input values appropriate to target's business – particularly the discount rate reflecting the business risk
Outputs communicable to the owners
Outputs verifiable
Not unnecessarily complex to interpret,
Not unnecessarily expensive or time-consuming to build/operate
Allows for all cashflows to/from the business, and for effect of reserving requirements
Takes into account interactions between assets/liabilities, and interactions with the company's existing business
Capable of being reused for the next target?

[7]

(ii) The model is likely to suggest a range rather than a single price.

The company may offer relatively high price if there are large synergies
– more efficient operations
– cross-selling opportunities
– Intangibles such as brand names, patents, unique staff knowledge (expertise)

High price may be cheaper than growing organically into desired business areas

But may offer a relatively low price
– if the target's market value is lower

– e.g. if target is experiencing management/operational difficulties so value is depressed
– or if market sentiment is currently adverse

Will offer a lower price than what company expects to finally pay, this will depend on negotiating strengths and/or bidding wars

[3]

(iii) It has a more diversified portfolio and so capital usage is less intense
– diversification coming either from different uncorrelated business lines
– or within the existing line but wider spread geographically/etc.

It has access to more policy/claims data so can build better models for pricing/valuation
It has economies of scale, for example in administration and marketing, systems

It may have a competitive edge if seen as more secure by consumers/brokers

[2]
[Total 12]

Part (i) was generally well answered, good candidates scored highly by making comments specific to the scenario. Part (ii) was not well answered, many candidates focussed too much on problems with the model rather than commercial issues. Part (iii) was reasonably well answered although only a few candidates considered the impact on capital requirements.

4 What are the objectives, profits, market share, competitive position?

Need to understand fully the product's benefits

Then build a model of the product's expected cashflows to calculate expected risk cost per policy, and add loadings for expenses, commission, profit and tax, and allow for reserving requirements and cost of capital and for reinsurance premiums/claims if applicable

T&Cs

Need to understand what will be the policy terms/conditions
- Excess levels?
- Exclusions for hazardous pursuits/self harm/etc.?
- How much choice will customers have?

Premiums

How will customers pay premiums

How and to whom will product be sold

What sales volumes are expected/targeted: are these realistic, bearing in mind alternative products in the market, will these still be realistic if competitors react to this product launch

What is the commission structure

Claims

Nature of claims, for example fixed or real amounts: will claim amounts be fixed or will they depend on other factors, for example medical or legal costs (and inflation)

Frequency of claims

Expected average claim amount

When will claims be paid, soon after event and within policy term, or after a lengthier claims underwriting process

Will there be additional legal costs or significant claims underwriting and processing costs

Data

Will be essential for estimating claim frequencies and amounts

But as this is new product the insurance company won't have any

May be able to get data from other insurers or from data on other products, more likely from reinsurers or from published industry data or government statistics for the general population

Important to check any data for validity and relevance to the product; and adjust as necessary; and be aware of likely problems/limitations, for example if data is old and population trends mean it is unlikely to remain relevant

Analysis

Analyse data over suitable period (depending on volume of data)

Split into major risk groups e.g. gender, location

Aim for balance of credible/homogeneous risk groups

Use data to calculate exposed to risk and number of incidents for each group

Adjust for influences from data source, especially different underwriting standards (or none)

Judgement needed if credible data not available, or insufficient data for reliable estimates

Assumptions

Claim amounts linked to medical costs, so need assumption for inflation

Expense/profit loadings consistent with general company policy, and competitive position of the market

Overall prudence in assumptions will depend on company's risk appetite
Tailored to perceived riskiness of this product

Loading required for fixed expenses such as initial expenses of developing and launching the product

After launch, will monitor experience (sales, claims, etc.) and adjust premiums appropriately.

[13]

A wide range of marks on this question. Good candidates structured their answers well so as to avoid repetition and cover a good range of issues such as policy terms.

5 (i) Scenario analysis is a method of evaluating risk where a full mathematical model is not appropriate. It is the process of measuring the impact of the risk as a result of changes for combinations of variables under plausible scenarios.

Stress testing measures losses under extreme values of individual variables, to identify weak areas or the impact of a stress

Stochastic Modelling is an extension of stress testing where some variables are stressed, so deriving a distribution of outputs

[3]

(ii) Stress testing. The extreme value of the FTSE after a fall could be applied in the valuation interest rate calculation for example

An individual company capital assessment review would look at plausible adverse scenarios and quantify the impact of them. For example a key member of staff gets run over by a bus: this is not quantifiable by mathematical model and so scenario analysis is used in this situation

Stochastic Modelling is applicable here. We are looking at the entire portfolio and also the modelling of guarantees requires that some variables are modelled simultaneously.

[3]

(iii) A standard model for SCR is a single standard model used by all insurers other than those with an approved internal model.

A standard model has to be able to be used in a cost effective way for a wide range of insurers; with different risk profiles and of different sizes.

The standard model is therefore required to be less complex; and less time-consuming

However, the standard model has the disadvantage that it aims to capture the risk profile of an average company; and approximations are made in modelling risks; which mean that it is not necessarily appropriate to the actual companies that need to use it; and the regulator might need to build in appropriate prudence accordingly.

An alternative to the standard model is the internal model designed by an individual insurer to calculate the solvency capital requirements reflecting the specific risk profile of the insurer; within parameters set by the regulator. Selection issues, could choose the model that allows the company to adopt lower capital requirements

An internal model being designed by the insurer can be more complex and sophisticated tailored to the risk profile. It can also be closely aligned with the insurer's economic capital model; allowing a higher degree of consistency between the SCR and the economic capital. Being tailored to the company it can avoid unnecessary prudence (i.e. lower SCR).

There will be considerable cost involved in developing/maintaining an internal model; and gaining approval for its use.

For a regulator a standard model provides a comparable basis for comparing a wide range of companies. So the use of a single standard model makes it easier for the regulator to decide which companies need most regulatory attention.

The regulator needs to define the standard model; and ensure that it is appropriate for the range of insurers being regulated

An internal model requires the approval of the regulator before it can be used.

There will also be considerable time and effort involved on the part of the regulator in reviewing and approving an internal model. The cost of an insurer developing an internal model will act to limit the number of insurers where it is economical to develop an internal model. For the regulator this will act to limit the number of internal models applied for and so the resources the regulator needs to approve and then to continue to supervise approved internal models.

An internal model is tailored to the risk profile of an individual insurer, however, the risk profile will change over time; so the regulator will require that the internal model is kept up to date and developed further so that it continues to the fit the risk profile of the firm.

The regulator has the responsibility for maintaining confidence in the financial system and protecting consumers.

The regulator in approving either a standard or internal models needs to make sure the model will be effective at maintaining confidence in the financial system and protecting the consumers of the insurer; not just at the point of initial approval, but also that it is resilient over time.

[10]
[Total 16]

Parts (i) and (ii) were generally well answered. In (ii) we gave credit for appropriately argued alternatives; but some candidates did not give plausible reasons for their choices. Part (iii) was less well answered; many candidates didn't relate their answers to the purpose (determining SCR) and didn't really consider the regulator perspective.

6 (i) Investment trusts are a form of closed-ended fund.

They are companies whose function is to manage shares and other investments.

They have a capital structure exactly like other public companies, and can raise both loan and equity capital.

Investment trust shares are usually listed on a stock exchange; and their shares are bought and sold in a similar way to other quoted shares, price is determined by the market.

Their share price may be either at a premium or a discount to the trust's underlying asset value

Investment trusts have boards of directors who are responsible for the direction of the company; but day-to-day investment decisions are usually undertaken by investment managers such as merchant banks or specialised investment trust managers.

A number of investment trusts may be managed by the same group of managers but have different directors and objectives.

Investment trusts have a stated investment objective, and new investment trusts usually have this written into their prospectus or offer for sale documents.

[4]

(ii) This investment trust can be used to invest in unquoted investments that may not be available to individual investors.

Specialist professional expertise will be obtained.

The investor will be able to invest in a diversified range of unquoted assets. This is likely to give diversification from their existing investments.

The costs could be much lower than for direct investment.

Any holdings are divisible so part of a holding of the trust can be sold.

They can take advantage of any gearing, potential for higher returns by changing equity to debt ratio

They may be able to purchase the investment trust at a discount to net asset value. Discount exists but need to be able to identify it and then also to take advantage i.e. by selling at the right time.

The investment trust is closed ended so it will not be a forced seller of its investments.

There may be potentially high returns.

There may be marketability issues with unquoted investments but these will not be an issue for the trust so it can take advantage of any marketability premium.

[3]

(iii) **Bonds**

Will need to know:
time until the next cashflow is due
coupon – frequency of payment, if increasing relevant index and indexation lag redemption date and amount

any options will need to be allowed for

will need to discount at rates consistent with the market spot yield curve; for the relevant default risk, with appropriate adjustments for lower marketability

[7]

Equities

Will need to know how much the next interim and final dividends are expected to be; and when they are due

Will also need to estimate expected future dividends. Can use dividends based on profit forecasts for the first few years; and then apply a long term average

growth rate. (Alternatively, could assume that the dividends grow at a constant rate. This may, however, not be a realistic assumption.)

Will need to ensure that the growth rate assumed is appropriate for the company being valued.

The dividends will need to be discounted at an appropriate rate: can use the yield on long term government bonds plus an appropriate addition for the risk of the income stream and lack of marketability, or could use index-linked government bond yield and estimate the real, rather, than nominal rate of dividend growth.

There is difficulty in setting the discount rate, so consider how material the rate is and sensitivity of answers

(iv) The main stock market index is unlikely to be an appropriate comparator. It is likely to consist of equities in large companies and will not hold bonds.

The investments in this investment trust are different to the index components

The trust contains bonds as well as equities and bonds may have underperformed equities

The companies may be in different sectors, or may be smaller, or may be in different countries/geographies. These sectors/etc. may have underperformed relative to the stock market.

Also the trust's managers may have underperformed by poor stock selection; or by poor allocation to sectors bond/equities/etc.

The method of valuing the unquoted assets may have changed. The assumptions made when calculating the values of the unquoted equities and bonds may have changed.

Supply and demand factors. There may be a demand for stock market index resulting in an increase in the value. The increased supply of the unquoted investment has resulted in the decrease in the value of the investment

There could have been a large outflow of charges so had to sell assets from the trust. Trading expenses are incurred by the trust but not the index

[3]
[Total 17]

Part (i) was reasonably well answered, but not as well as might be expected for a straightforward question. Most candidates scored highly on part (ii). Part (iii) was not well answered – we were looking for a simple discussion of what the cashflows would be and how to appropriately discount them. Part (iv) was generally well answered.

7 (i) *Choices – what to do on wind-up?*

The Scheme Rules will say how benefits can be secured on wind-up – the following options may exist:

- Although unlikely, given the sponsor's position, transfer the liabilities to another scheme with the same sponsor
- The scheme could transfer the funds directly to the beneficiary to extinguish the liability; but legislation may not allow the individual to receive the capital value of their benefits.
- Allow the individual members to place the funds into a personal pension or insurance policy or in the scheme of any new employer via a transfer value payment (because the scheme is in surplus it could decide to increase the normal transfer value to extinguish the liability in that way). Or transfer the benefits to a central discontinuance fund, if available
- The scheme could transfer all of the funds to an insurance company to invest and provide the benefits by annuity policies – however the insurance company would charge for taking on the risks inherent in the scheme

Choices – what benefits?

The trustees will need to decide on the final benefits that the members should get

The benefits that will be paid will be affected by the following factors:

- The rights of the beneficiaries which will depend on the terms under which the scheme operates; and any overriding legislation
- The expectations of the beneficiaries; which are likely to the benefits that would have been available had the scheme not discontinued; there may have been established discretionary practices which the trustees would like to continue
- In this case the scheme is in surplus and as such would be able to meet the expectations of the beneficiaries and a higher benefit will be paid. However the trustees could decide to increase members' benefits with the surplus; this will be particularly difficult as the majority of the members have not retired yet.

If the benefits are to be increased this is likely to be at the discretion of the trustees; but will need to consider legislation and the scheme rules; as these might dictate how these are to be paid and in what form (e.g. increase directly to the pension or changing the increases that apply every year)

The trustees could consider whether any individuals are more entitled to share in the surplus than others

The surplus may pass back to the sponsor (or its creditors in insolvency) ; and they may have power to refuse any benefit improvements

If the scheme is being wound up then the expenses of the wind up and securing appropriate provision for the liabilities will also need to be considered before using the surplus to increase members' benefits

More issues

The scheme may have been in surplus but not on a wind-up basis (insurance cost etc.), this will depend on the basis used; and depends on what will happen to the benefits on wind up; then the trustees need to source additional funds or reduce benefits

The funding position may have changed since it was assessed and may change over the period before the trustees could secure benefits.

The trustees should consider what can be done to reduce the risk of the funding level falling; in particular matching the investment strategy to wind-up basis; although this may not be investible e.g. annuity prices influenced also by competition/mortality/etc.

Also the trustees should consider what can be done to get firm annuity quotes (or transfer cost, etc.) as soon as possible

The trustees will need to assess the scheme's membership data. Is this complete and accurate for the purposes of securing benefits? If not, what can be done to fill the holes? Note that sorting this out adds to expense and takes time.

Communication issues. The scheme needs to effectively communicate the wind up process and the impact on members. It also needs to give members a way to voice their questions and concerns

[11]

(ii) *Longevity*

A key risk for the insurance company will be the members living longer than the assumptions that were used for pricing

This is a particular issue for this scheme because the high proportion of members that are deferred members with a long time to retirement – this will mean the pricing assumption around possible improvements to life expectancy will be critical; and therefore the insurance company will want to consider possible medical advancements in future years. Deaths in deferment may be lower, thus more members live to receive pension

Even the members that have retired recently will be relatively young and hence this issue will still apply

Investment

The insurance company will need to invest the premium in a way that it will be confident that it can pay the benefits to the members as they fall due.

The benefit cashflows are likely to be very long term. Even the 30% of members who have retired recently may have life expectancies of over 20 years; and an expected period of over 40 years until they have all died; and an even longer period if pensions continue to spouses after members' death. And the 70% deferred members may retire on average in 20 years' time; but the youngest may retire much later.

Ideally they can invest in bonds that match the liability cashflows; but there may not be sufficiently long bonds giving reinvestment risk; and there is risk that the bonds default in the future. So actual investment returns may not be as expected

Government or AAA bonds will be most secure; but this may mean the company is either uncompetitive or expensive such that benefits may need to be scaled at outset such the scheme decides not to go with that option

They could decide to invest in assets where there is a good chance of long term capital growth (e.g. equity); but this would give rise to disinvestment risk when an income from the assets will be required

These assets may be riskier than other assets and this may mean the capital might be lost

Expenses

The ongoing expenses may be higher than anticipated in the pricing of the scheme

There is also a risk that expense inflation is higher than expected

Data Risks

The company will be taking on all the benefits outlined in the scheme rules and this might be difficult for the insurance company to understand or price (or the assumptions for them might be incorrect) – for example the spouses benefit may apply at the time of the members death and not at outset (i.e. the member could marry someone between retirement and death).

Equally the company may not have all the correct individual member data for the scheme.

Inflation Risk

The member's benefits may increase with inflation and this rate may be higher than the company had considered at the onset of the contract

Legislation/Legal Risk

Legislation may change in the future such that benefits could be increased and this could lead to the insurance company making losses. There is also the risk that members contact the insurance company and challenge the benefits being offered and that the insurance company had misunderstood the schemes rules

If the company is using reinsurance then there is a risk the reinsurance company defaults on its obligations

The deferred members may also be able to transfer the benefits out which may lead to a liquidity risk if the assets that the company are invested in are not freely disinvestible

There may be optionality in the benefits that presents risk to the insurer, e.g. retirement date/options

[8]

(iii) The main tools that can be used to aid the management of risk are:

Diversification
Underwriting at the proposal stage
Claims control systems
Management control systems

The risk can also be passed on, for example longevity swaps and bonds, interest rate or inflation swaps

Diversification

The insurance company may already be using this deal to diversify its risks e.g. by class, or within class e.g. by geography, annuity type; but it also needs to consider diversifying its investments (i.e. not hold all in one bond, spread over a number of assets within the asset class)

If the contract is large and they are going to use reinsurers then they will need to consider diversifying across a number of providers of the reinsurance

Underwriting at the proposal stage

The particular risk here is that people are going to live longer than expected – given that the benefits are defined it might be difficult to underwrite the actual individuals

However the company can investigate the mortality experience of the scheme, general location of the main members (and how this relates to the general population) and also the type of jobs the members of the schemes had

In terms of understanding the data (e.g. to get the best assumptions for spouses benefits) to ensure the correct benefits were being taken on the insurance company could insist on going through the schemes records and using other sources of data to get the best information possible

Claims Control Systems

The insurance company will need to guard against fraudulent claims (spouses not existing)

Management Control Systems: good management control systems can reduce a provider's exposure to risk

E.g.

- Data Recording: The company will want to ensure that it holds good data on all the risks it insures – it will want to ensure that it knows about all the deaths and have them recorded correctly and include whether a spouse benefit is liable
- Accounting and auditing – enables proper provisions to be established
- Monitoring of liabilities – protects against aggregation of risks, also need to consider inflation assumptions and how these may move as the market changes
- Reinsurance – the insurance company could consider using longevity reinsurance to reduce this risk OR full quota share type reinsurance to remove some of the investment risk.

[6]
[Total 25]

Overall this was the least well answered question on this paper. Many candidates simply didn't write enough in part (i), perhaps put off by lack of familiarity with defined benefit pensions, but missed the general points about investment risk and reliance on data. Most candidates scored slightly better on parts (ii) and (iii), but generally didn't answer in sufficient depth for the marks available (in some cases this seemed to be because of time pressure).

END OF EXAMINERS' REPORT