

# **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.

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Chairman of the Board of Examiners

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## 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  $t$  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  $p$ th 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

Longevity

- 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

Investment

- 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

Inflation/index linked

- 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 than those 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 have 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 by the supplier). 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**